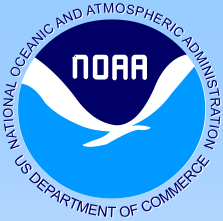
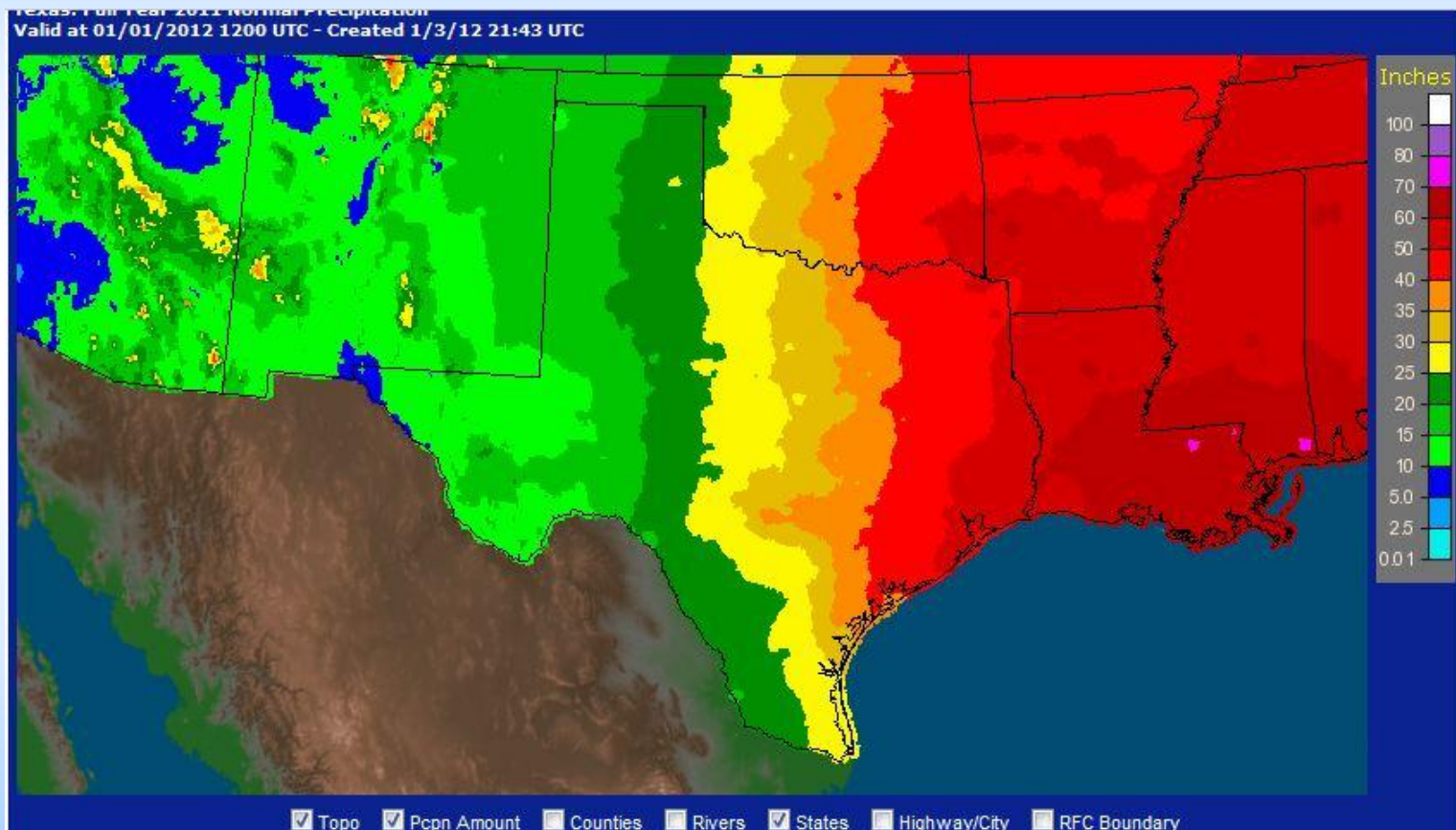
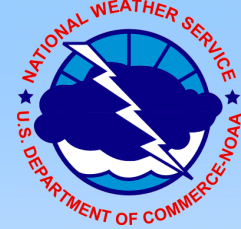


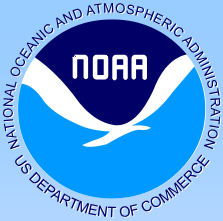
Climatological Context and Evolution of the 2010-2012 Drought in the Southern Plains and Southern Rockies

Victor Murphy
Climate Service Program Mgr.
NWS Southern Region HQ

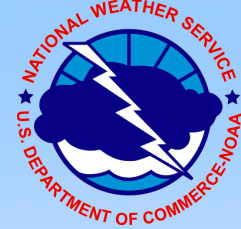


Climate Variability and Drought are Common in OK, TX, and NM.

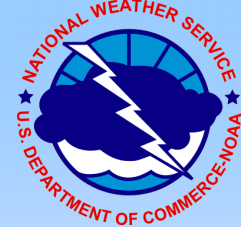
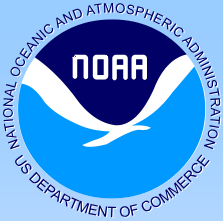




Climate Variability and Drought are Common in OK, TX, and NM



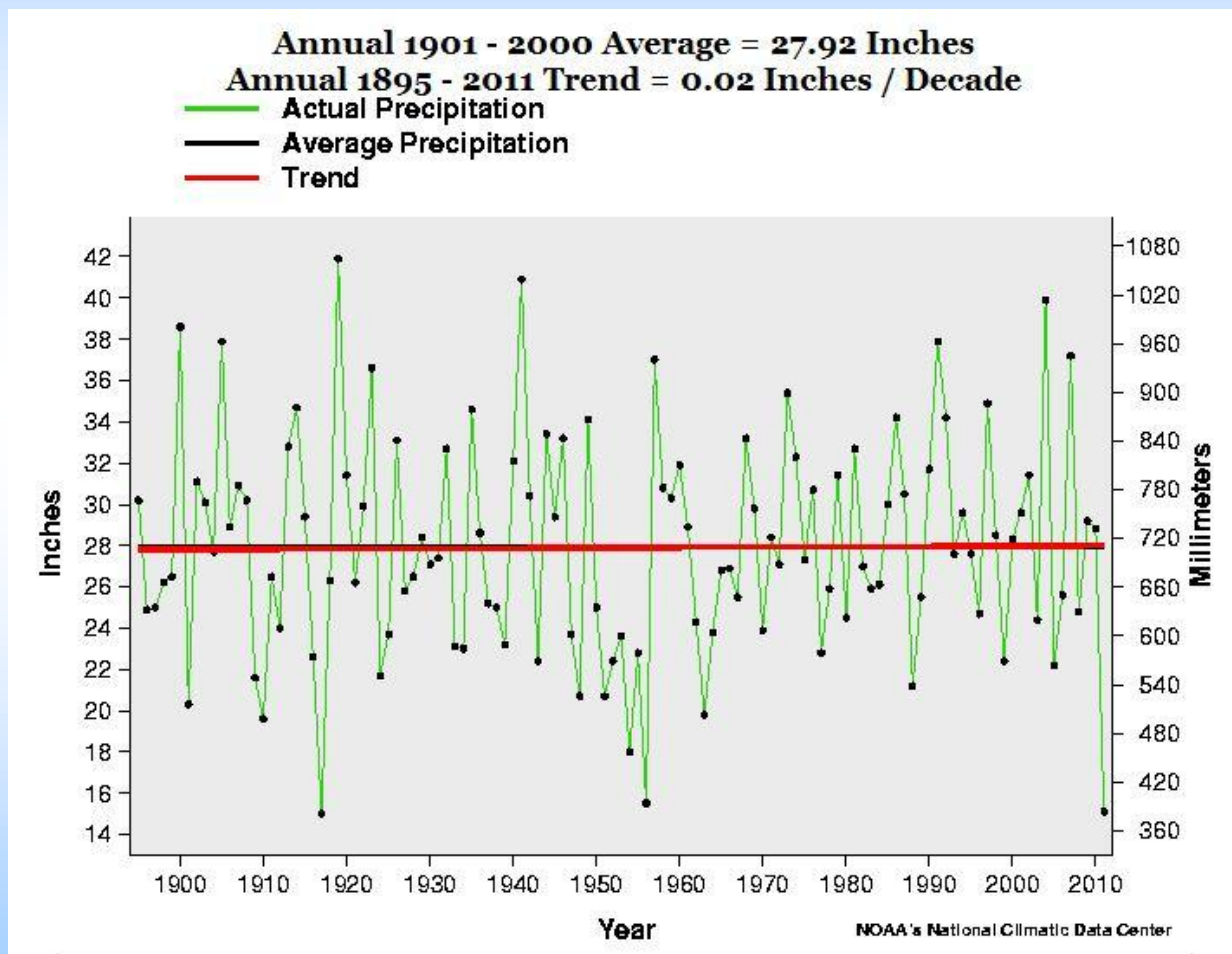
- Climate variability is a naturally occurring phenomenon across OK, TX, NM.
- Despite the average yearly state precipitation of about 28" in TX there have been individual years with as low as 14+" and as much as 42+".
- The multiyear drought of 1950-1956 is still the long term drought of record for Texas.
- However, 2011 has now eclipsed 1917 and 1956 as the most intense 1 year drought in Texas since modern recordkeeping began in 1895, based on lack of observed precipitation and the Palmer Drought Severity Index (PDSI).



Climate Variability and Drought are Common in OK, TX, and NM

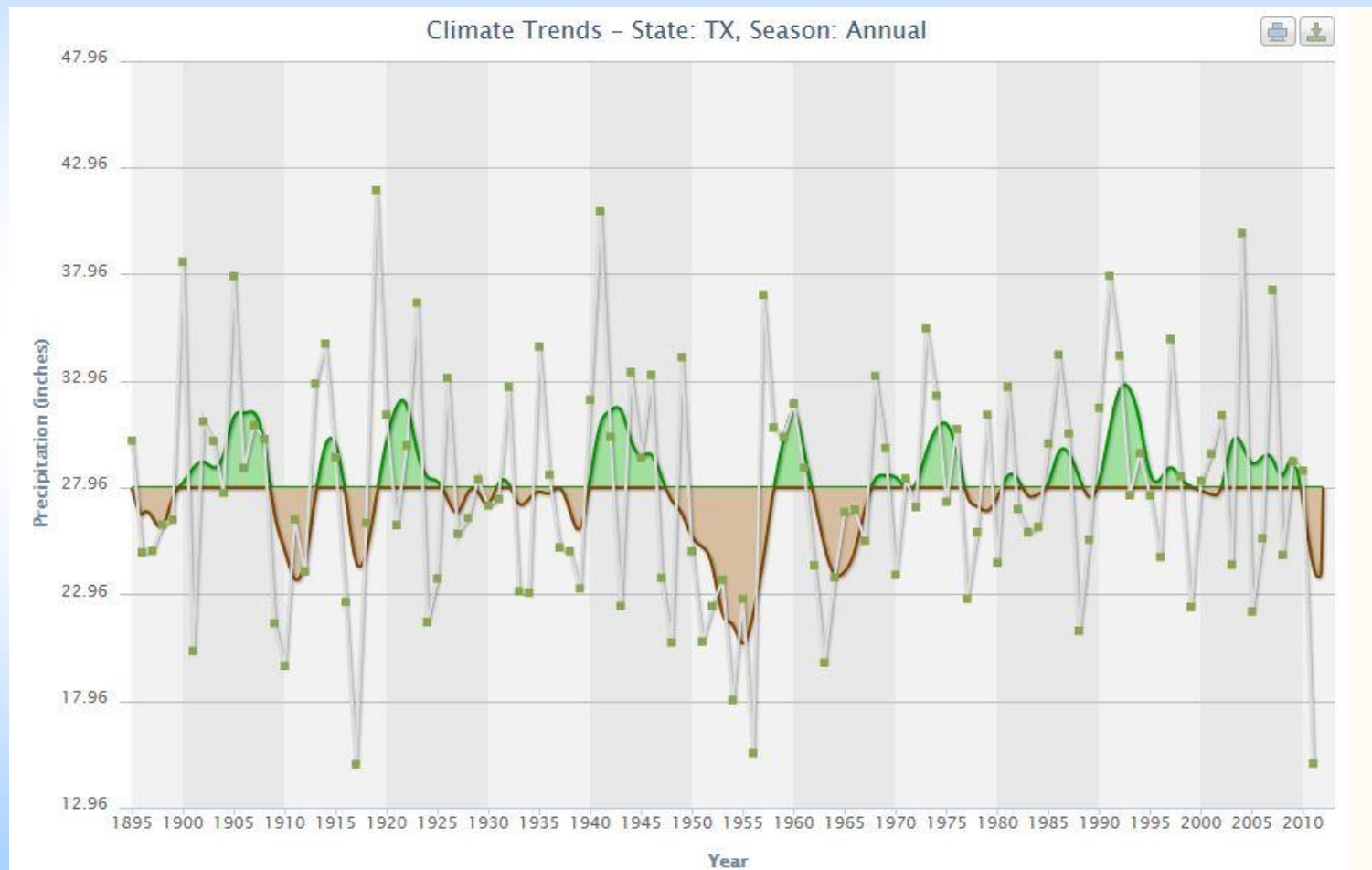
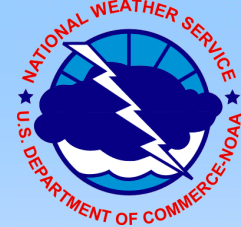
- Despite the average yearly precipitation of 34" in OK, yearly variability can range from 19" to over 48". October 2010-September 2011 saw most intense 1 year drought on record since the mid 1950s.
- In NM, statewide average yearly precipitation is 13.5", but extremes range 100% on both tails from 6.55" to 27". October 2010-September 2011 saw most intense 1 year drought on record since 1895.

Texas Observed Annual Precipitation

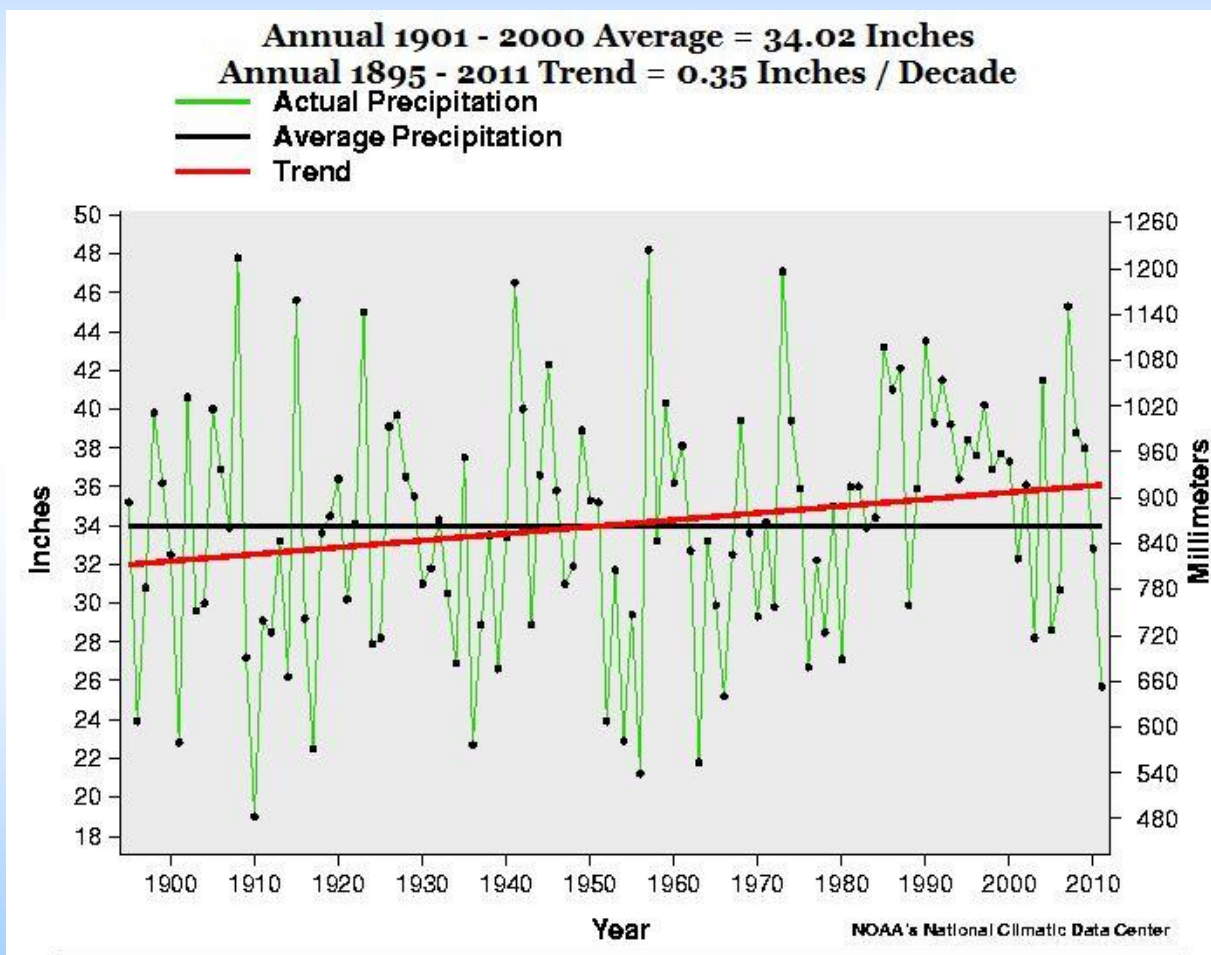




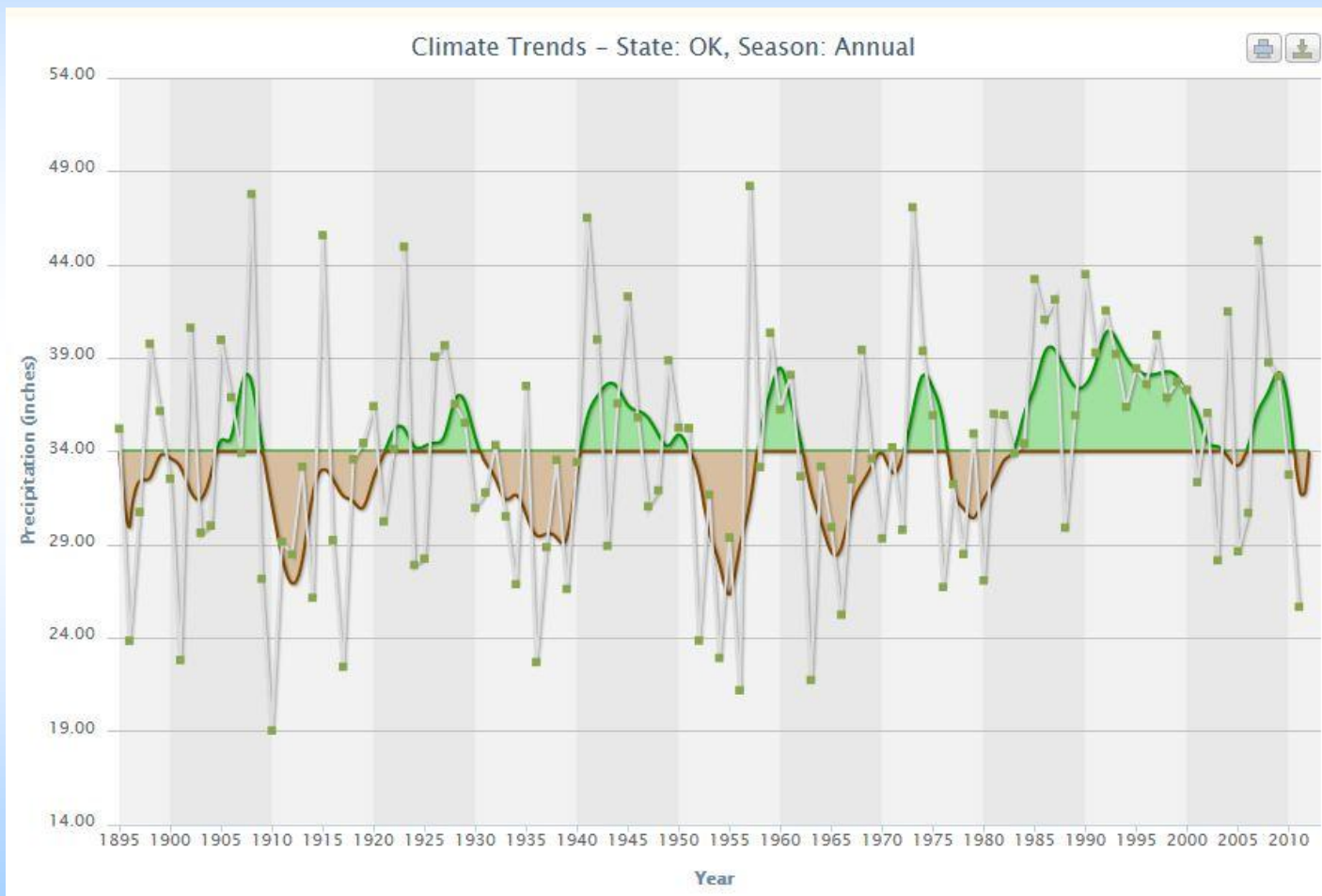
Texas Observed Annual Precipitation with 5 Year Rolling Averages.



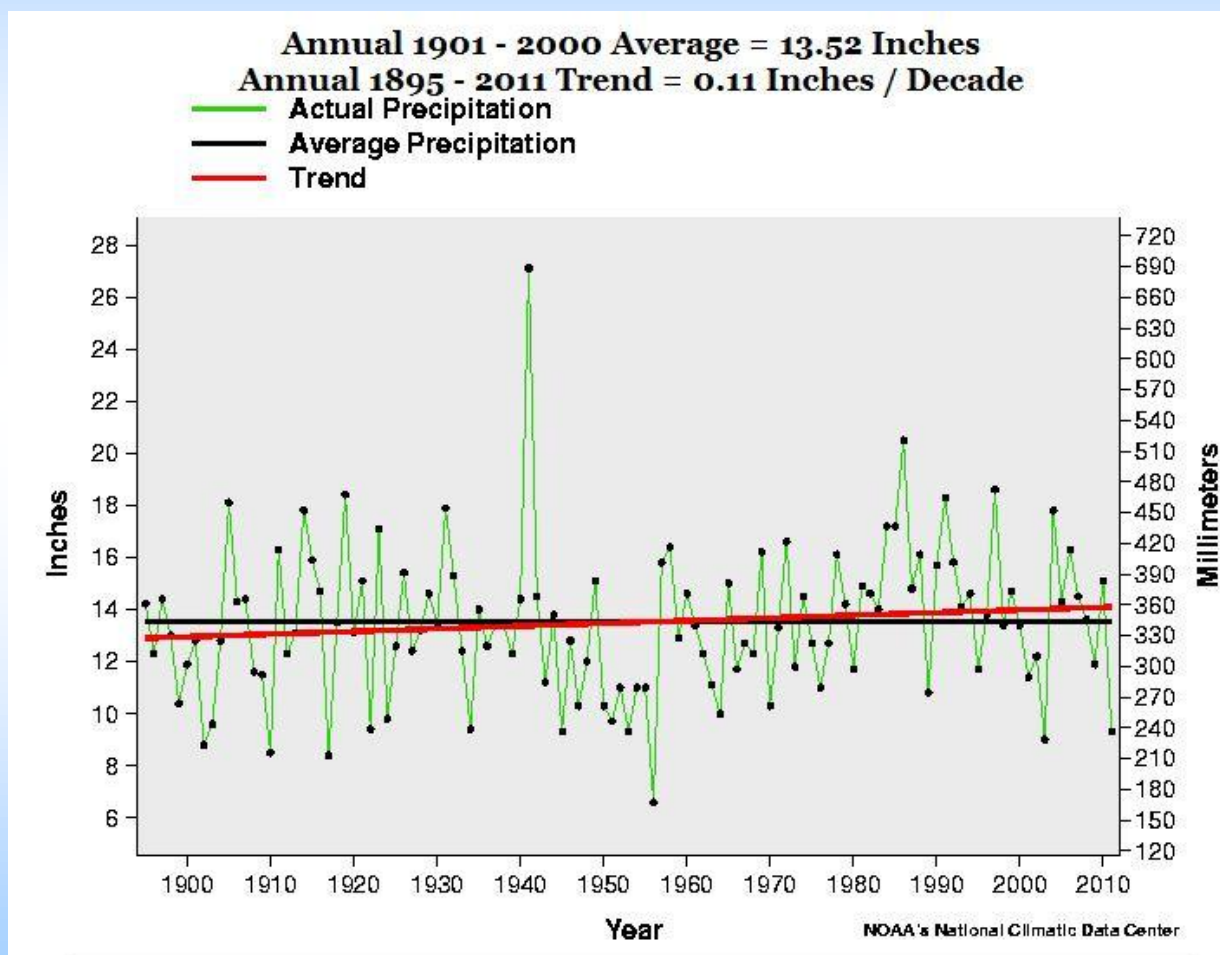
Oklahoma Observed Annual Precipitation



Oklahoma Observed Annual Precipitation with 5 Year Rolling Averages

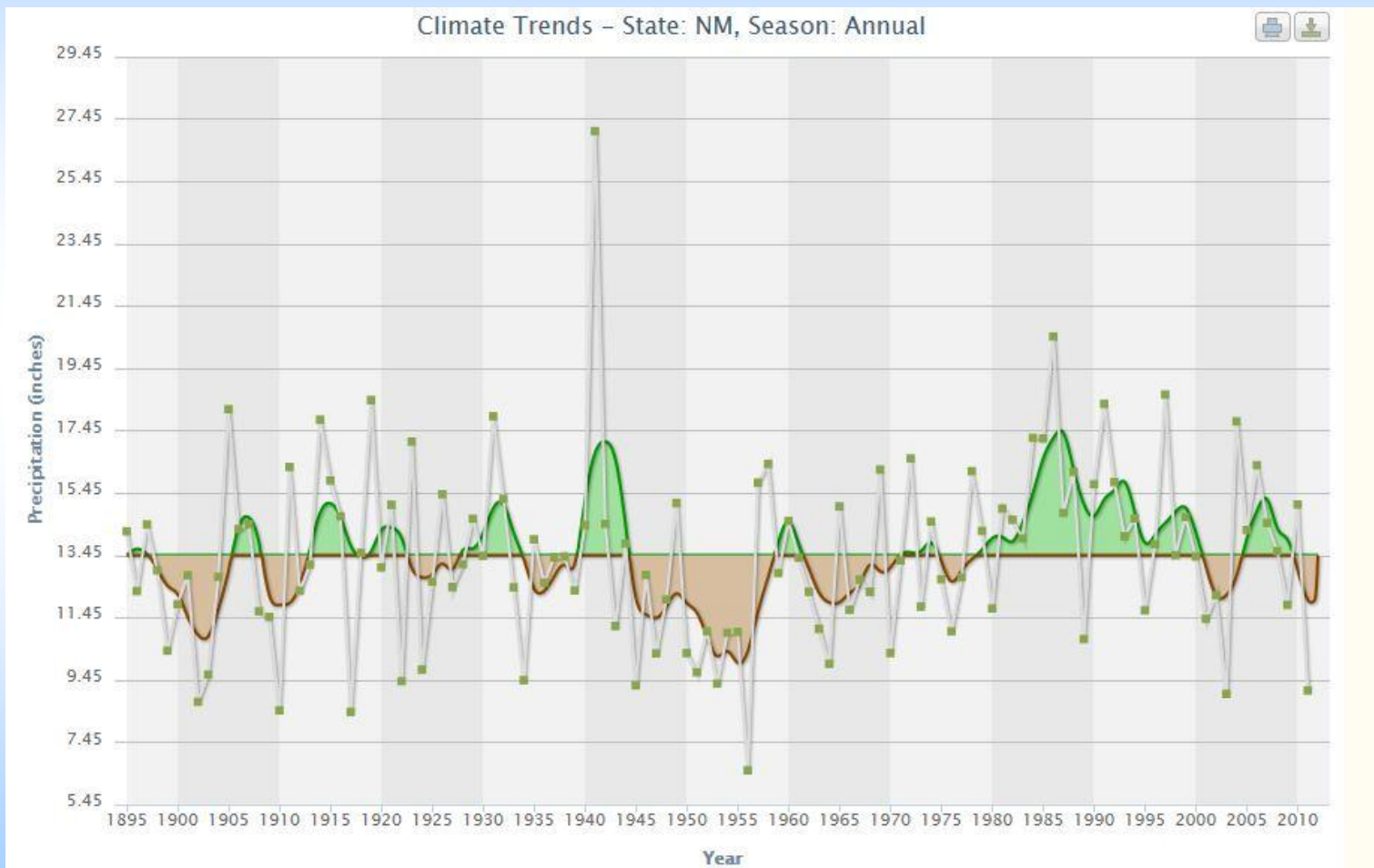
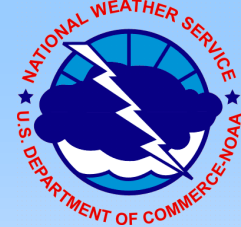


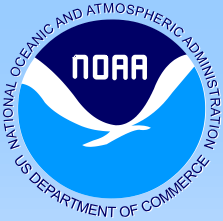
New Mexico Observed Annual Precipitation



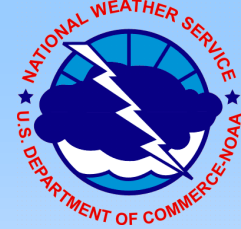


New Mexico Observed Annual Precipitation with 5 Year Rolling Averages



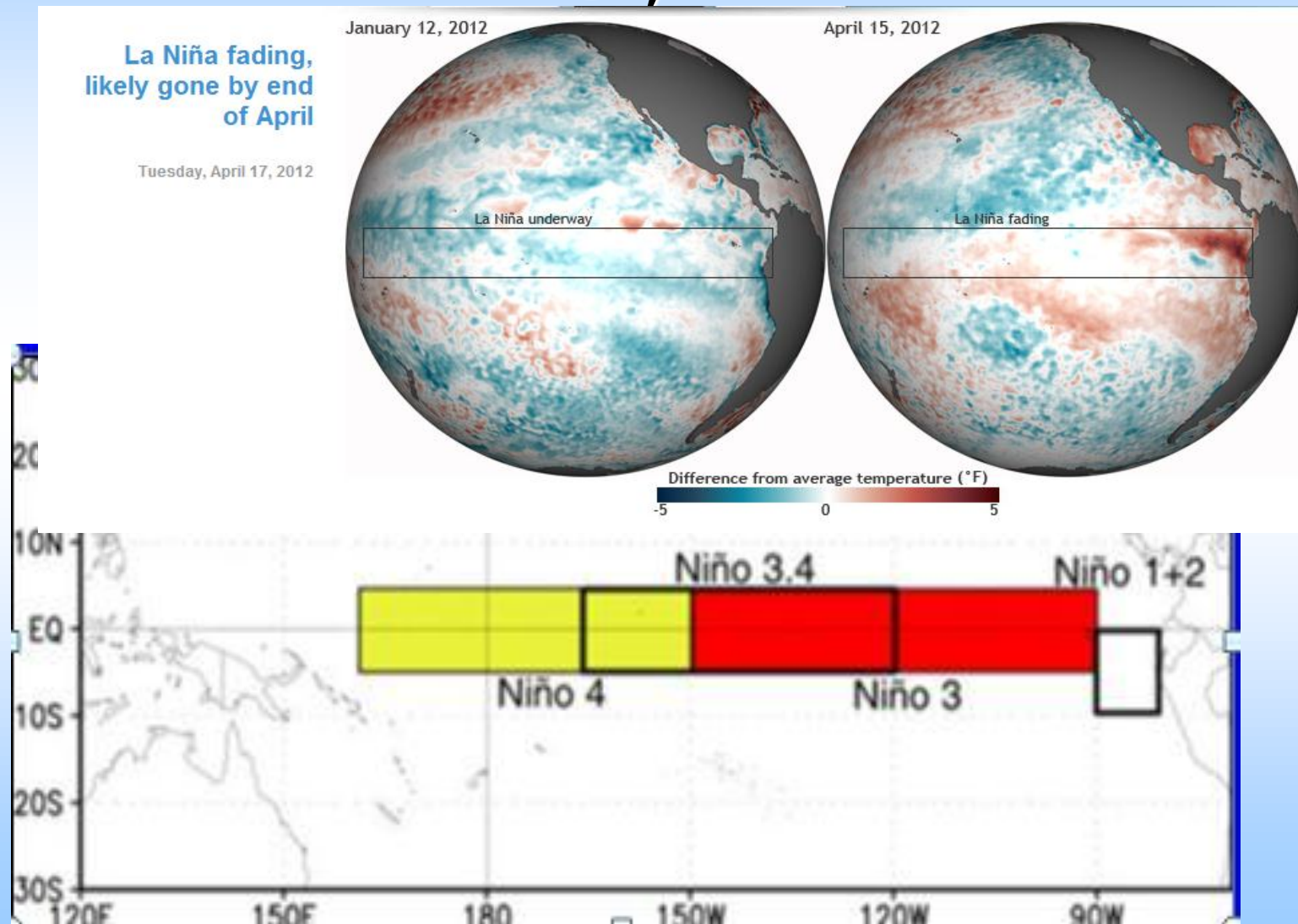


Unique Features of the Drought.

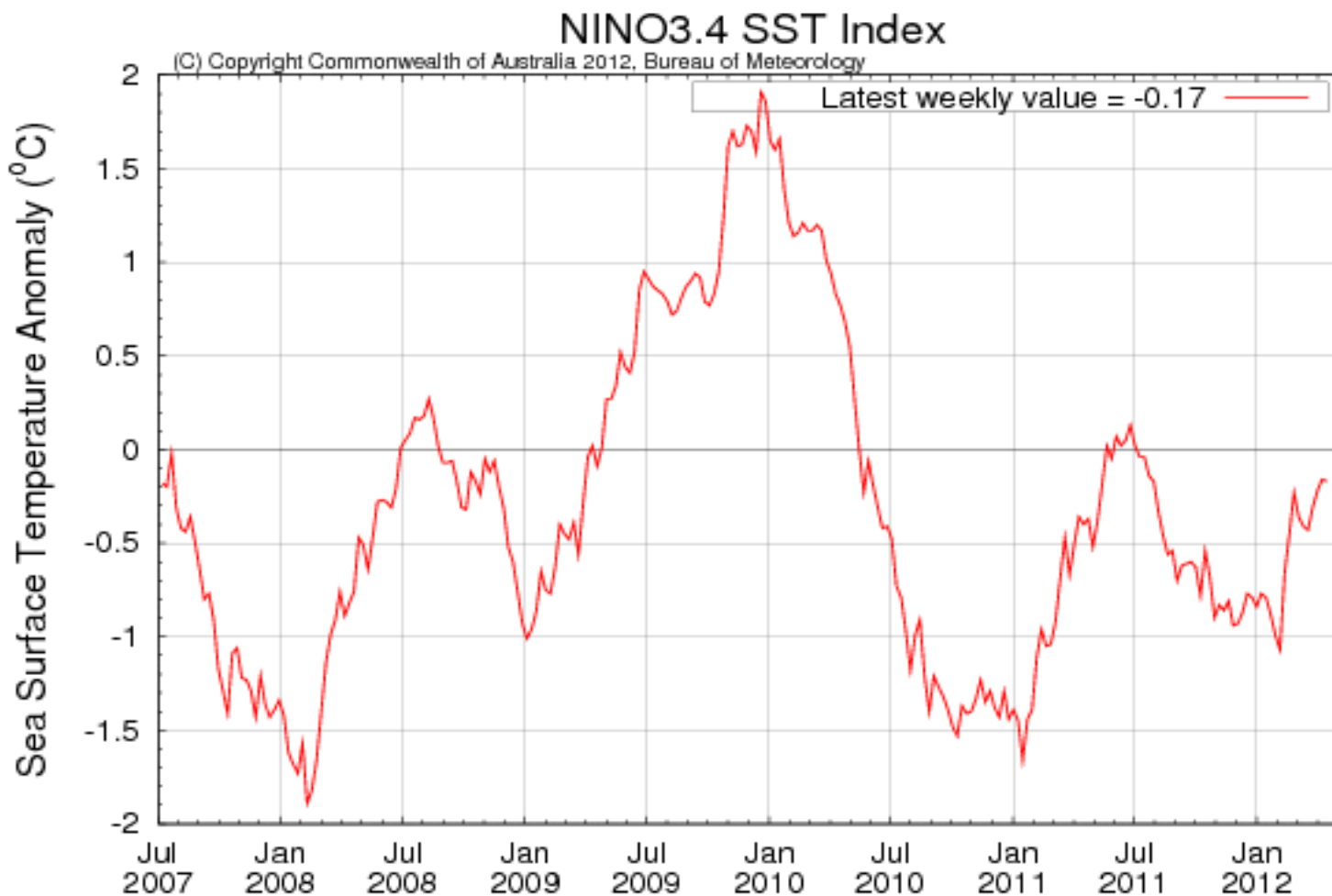


- Almost uniform onset across the entire region on October/November 2010.
- Spatial coverage of the drought enveloped the NM/TX/OK region.

A Strong Correlation Exists Between Sea Surface Temperatures in the Equatorial Central Pacific Ocean and Precipitation in NM, OK, TX



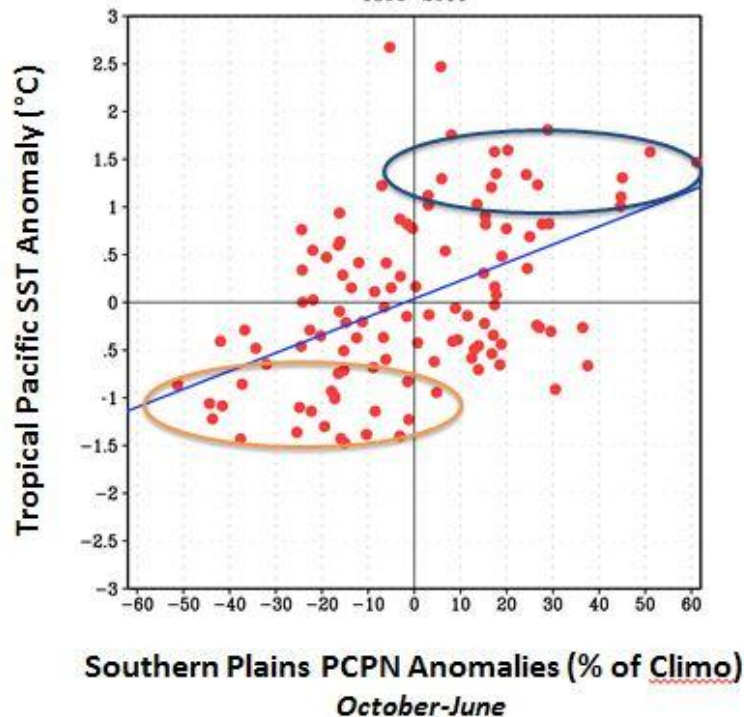
Sea Surface Temperature Anomalies in the Nino 3.4 Region over the past 5 years



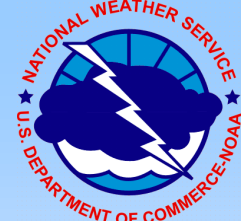
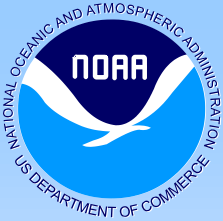
Scatter Plots Show Strong ENSO Correlation for Southern Plains

**There is a Robust History of Oct-June Southern Plains Dryness during La Nina:
But, Why Has this Year Seen Record Setting Drying?**

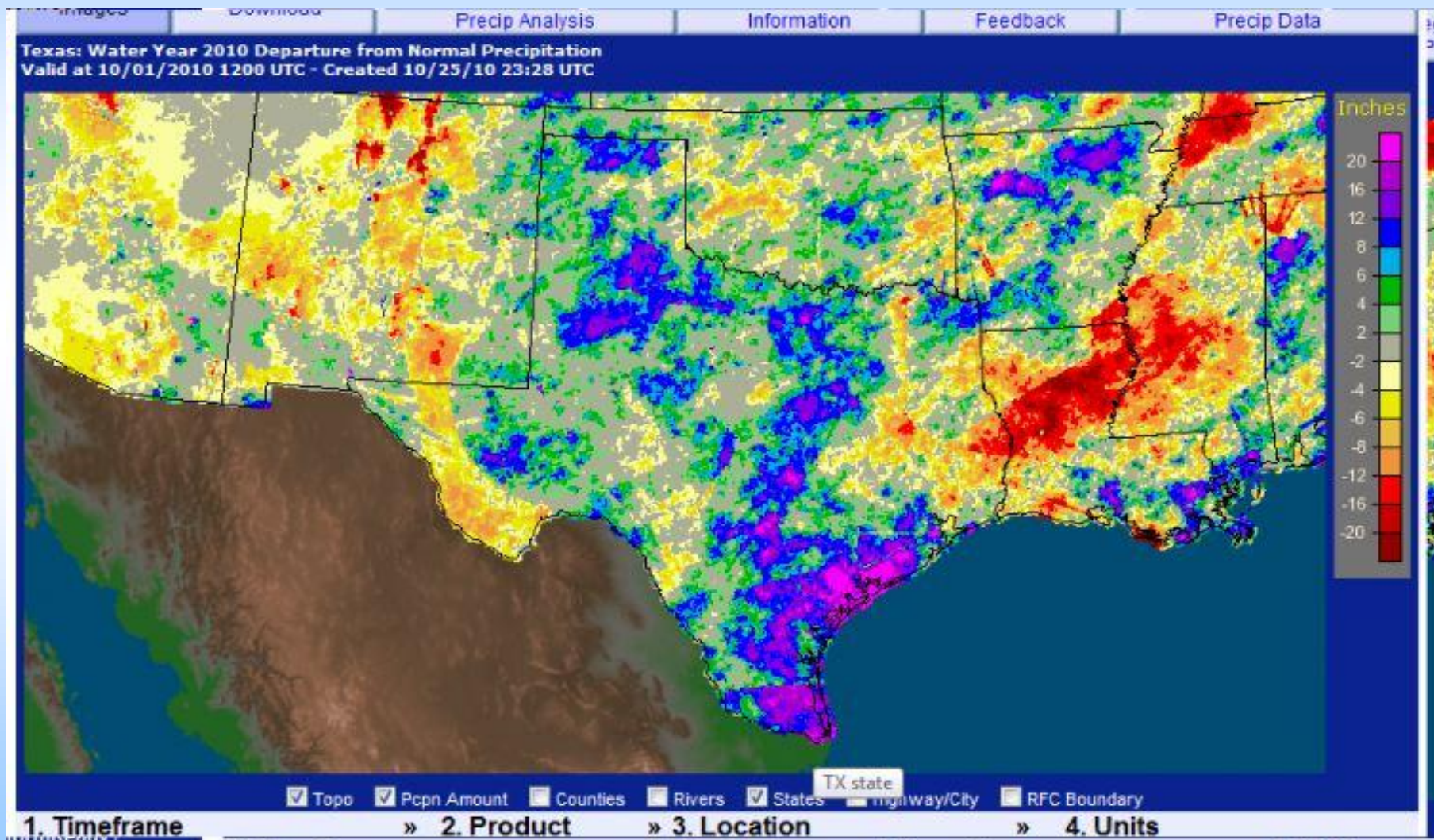
Oct-Jun Southern Plains Precipitation vs.
DJF Cold Tongue Temperature
1896-2011



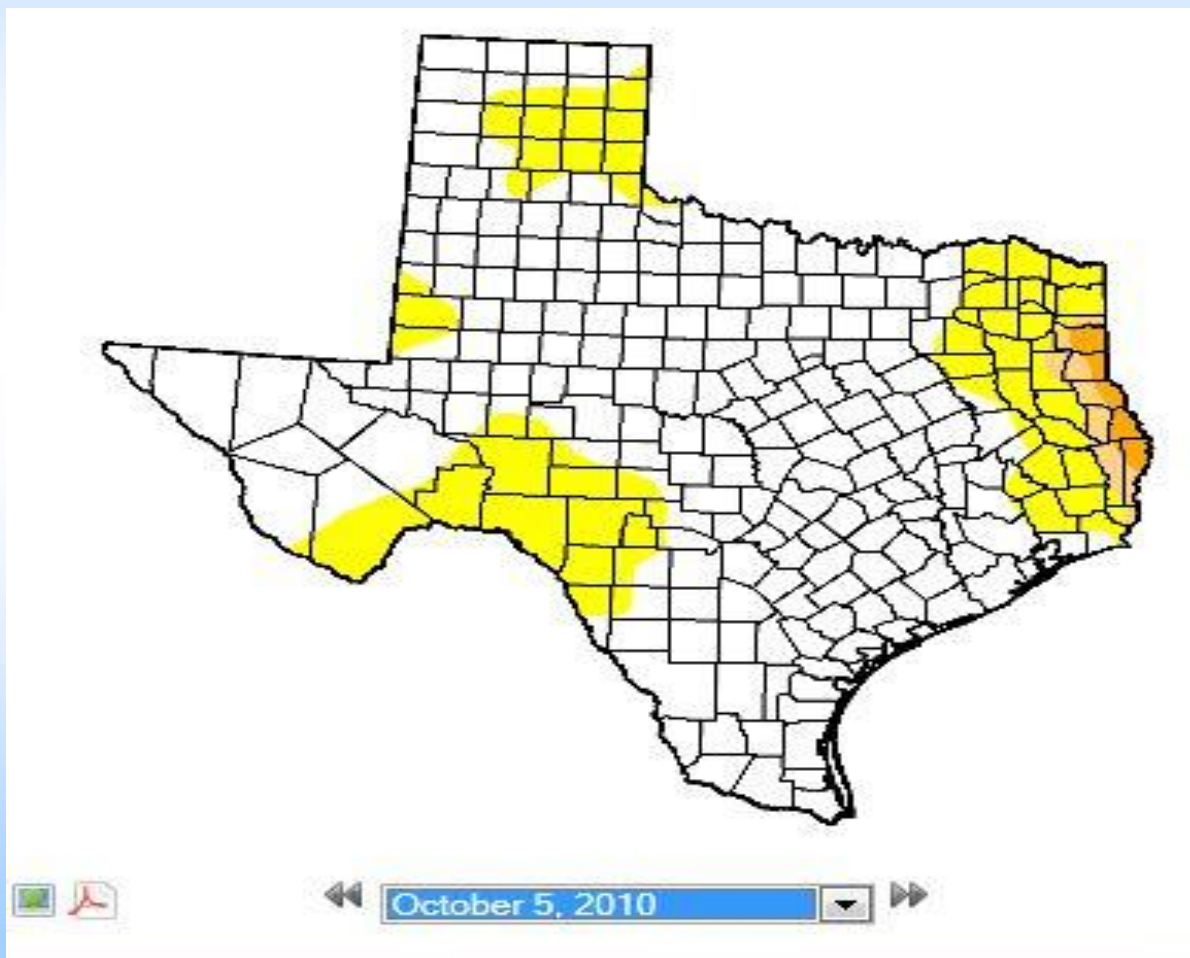
Data Courtesy of Marty Hoerling, NOAA ESRL



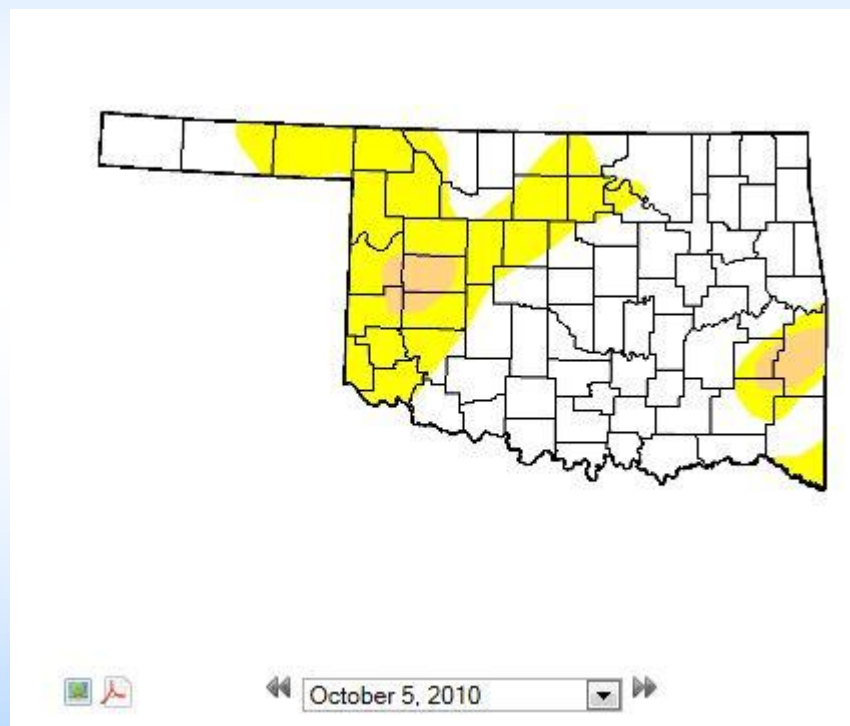
Precipitation Departure from Normal. 1/1/10-10/25/10.

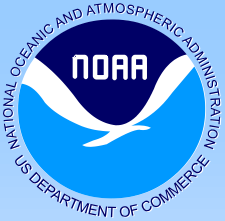


Only 2% of TX in Drought on October 5, 2010.

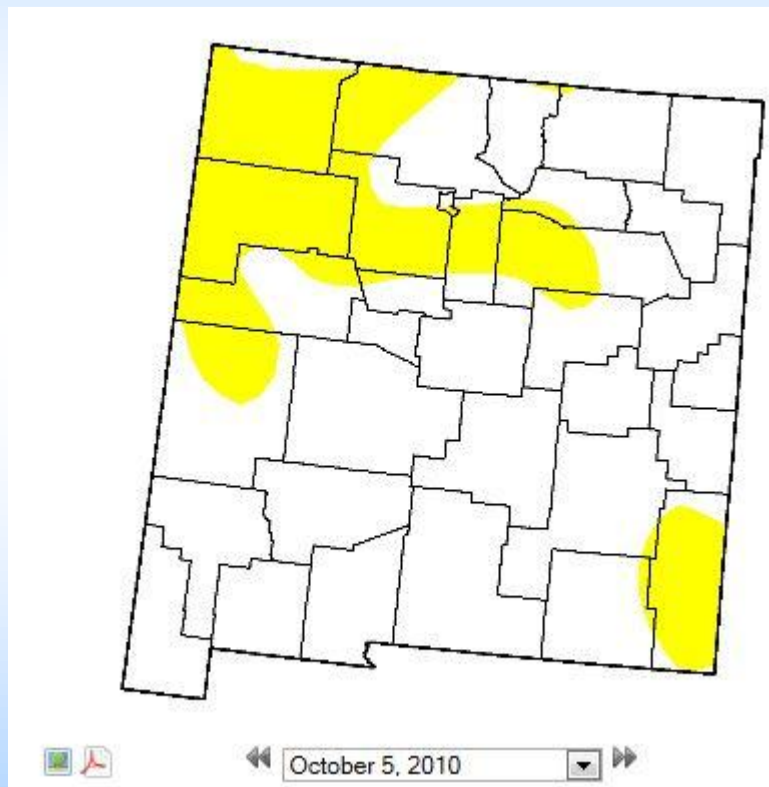
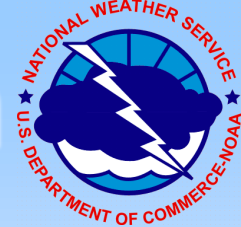


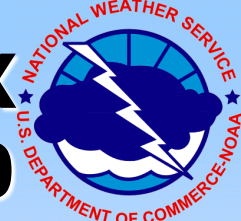
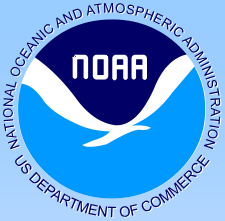
Only 4% of OK in Drought on 10/5/10



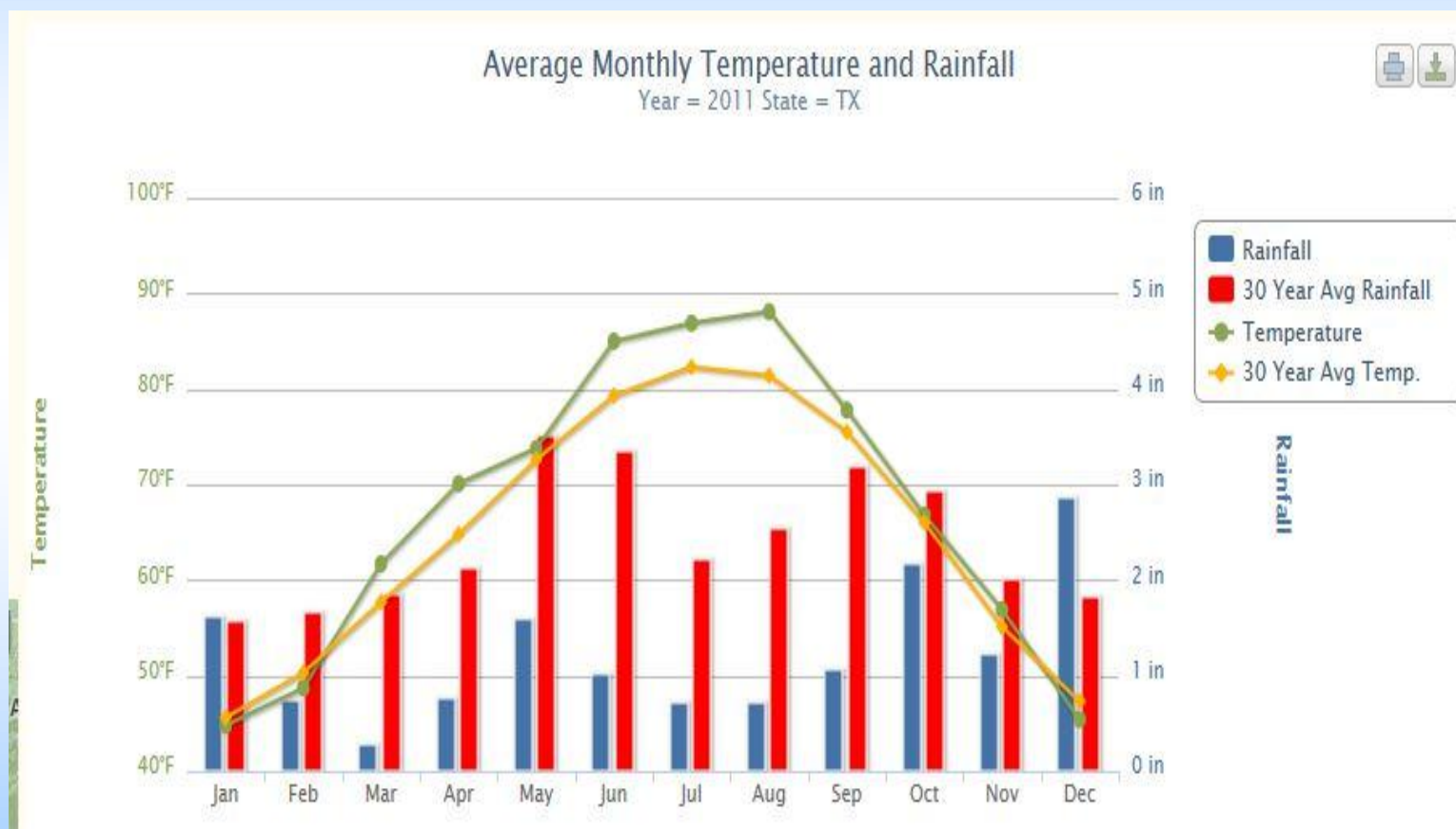


0% of NM in Drought on 10/5/10





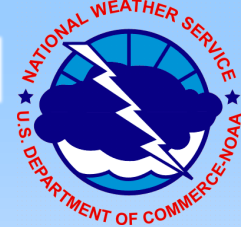
7 Consecutive Months (Mar-Sept) in TX with each month having the Bottom 10 Driest Precip



Graph Courtesy of SCIPP

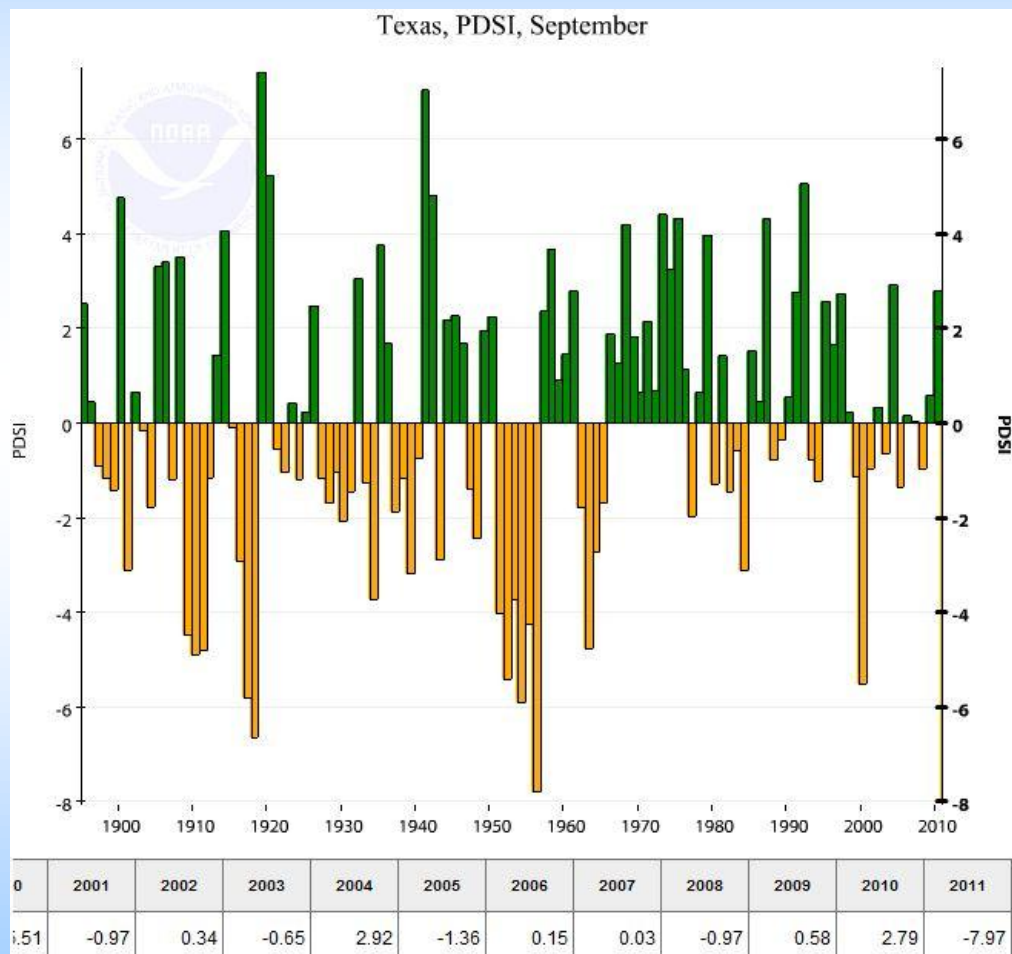


At the End of September 2011, all time frames from 4 months to 12 months were the driest ever.



Period	Amount	20 th Century Average	Departure	Rank	Wettest/Driest Since	Record Year
Sep 2011 1-month period	1.08" (27.43 mm)	2.97" (75.44 mm)	-1.89" (-48.01 mm)	7 th Driest 111 st Wettest	Driest since: 1956 Wettest since: 2010	Driest: 1931 Wettest: 1936
Aug - Sep 2011 2-month period	1.80" (45.72 mm)	5.28" (134.11 mm)	-3.48" (-88.39 mm)	3 rd Driest 115 th Wettest	Driest since: 2000 Wettest since: 2010	Driest: 2000 Wettest: 1974
Jul - Sep 2011 3-month period	2.53" (64.26 mm)	7.61" (193.29 mm)	-5.08" (-129.03 mm)	2 nd Driest 116 th Wettest	Driest since: 2000 Wettest since: 2010	Driest: 2000 Wettest: 1900
Jun - Sep 2011 4-month period	3.56" (90.42 mm)	10.55" (267.97 mm)	-6.99" (-177.55 mm)	1 st Driest 117 th Wettest	Driest to Date Wettest since: 2010	Driest: 2011 Wettest: 1919
May - Sep 2011 5-month period	5.16" (131.06 mm)	14.06" (357.12 mm)	-8.90" (-226.06 mm)	1 st Driest 117 th Wettest	Driest to Date Wettest since: 2010	Driest: 2011 Wettest: 1919
Apr - Sep 2011 6-month period	5.93" (150.62 mm)	16.52" (419.61 mm)	-10.59" (-268.99 mm)	1 st Driest 117 th Wettest	Driest to Date Wettest since: 2010	Driest: 2011 Wettest: 1900
Mar - Sep 2011 7-month period	6.22" (157.99 mm)	18.26" (463.80 mm)	-12.04" (-305.81 mm)	1 st Driest 117 th Wettest	Driest to Date Wettest since: 2010	Driest: 2011 Wettest: 1900
Feb - Sep 2011 8-month period	6.96" (176.78 mm)	19.94" (506.48 mm)	-12.98" (-329.70 mm)	1 st Driest 117 th Wettest	Driest to Date Wettest since: 2010	Driest: 2011 Wettest: 1941
Jan - Sep 2011 9-month period	8.59" (218.19 mm)	21.49" (545.85 mm)	-12.90" (-327.66 mm)	1 st Driest 117 th Wettest	Driest to Date Wettest since: 2010	Driest: 2011 Wettest: 2007
Dec 2010 - Sep 2011 10-month period	9.33" (236.98 mm)	23.38" (593.85 mm)	-14.05" (-356.87 mm)	1 st Driest 116 th Wettest	Driest to Date Wettest since: 2010	Driest: 2011 Wettest: 2007
Nov 2010 - Sep 2011 11-month period	10.36" (263.14 mm)	25.25" (641.35 mm)	-14.89" (-378.21 mm)	1 st Driest 116 th Wettest	Driest to Date Wettest since: 2010	Driest: 2011 Wettest: 1941
Oct 2010 - Sep 2011 12-month period	11.18" (283.97 mm)	27.87" (707.90 mm)	-16.69" (-423.93 mm)	1 st Driest 116 th Wettest	Driest to Date Wettest since: 2010	Driest: 2011 Wettest: 1941
Apr 2010 - Sep 2011 18-month period	30.18" (766.57 mm)	44.52" (1,130.81 mm)	-14.34" (765.57 mm)	3 rd Driest 114 th Wettest	Driest since: 1956 Wettest since: 2010	Driest: 1918 Wettest: 1941

Drought of 2010/2011 the Most Intense on Record as Measured by the PDSI.

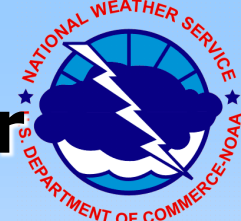
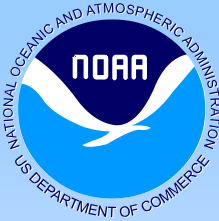


PDSI of -7.97 the lowest on record, eclipsing -7.80 in 9/56.

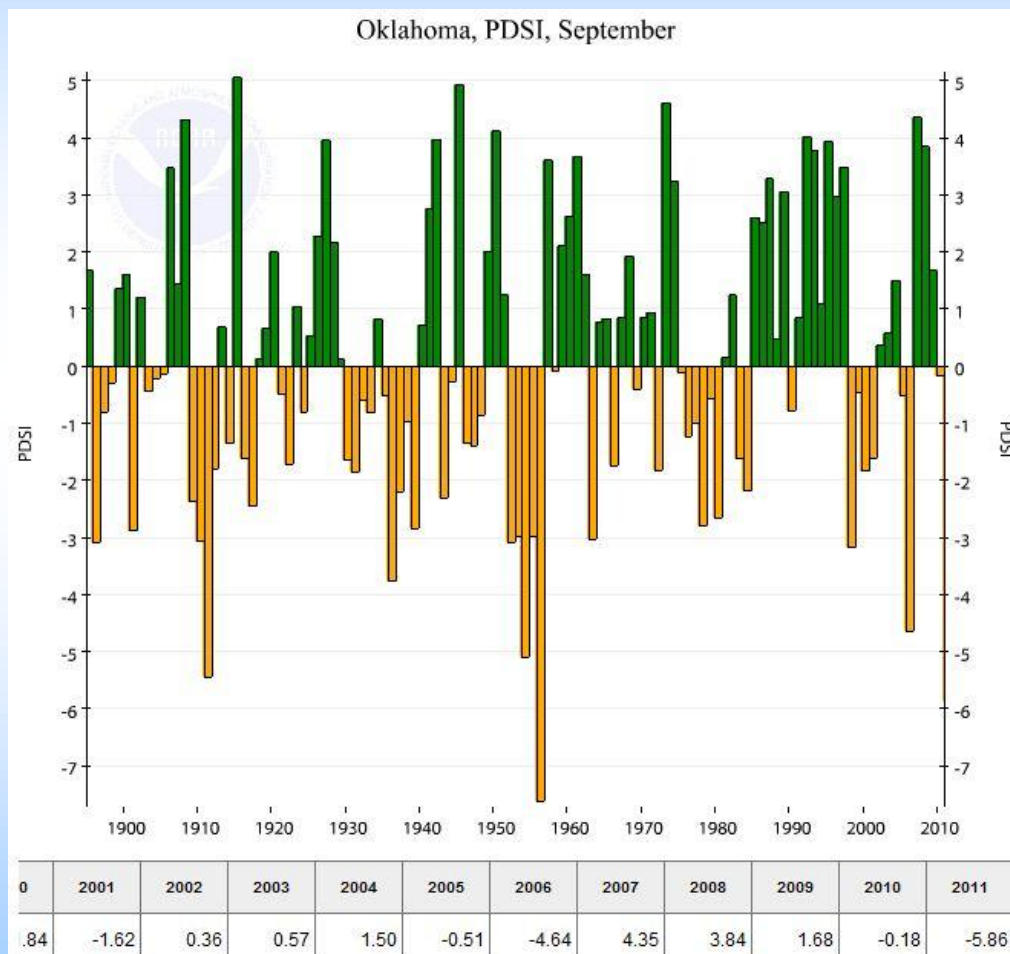


Oklahoma at the end of September 2011 was not OK

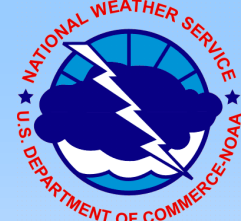
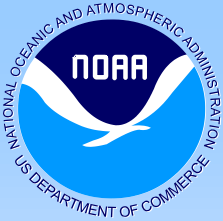
Period	Amount	20 th Century Average	Departure	Rank	Wettest/Driest Since	Record Year
Sep 2011 1-month period	1.52" (38.61 mm)	3.41" (86.61 mm)	-1.89" (-48.00 mm)	19 th Driest 98 th Wettest <i>Ties: 1901</i>	Driest since: 2004 Wettest since: 2010	Driest: 1956 Wettest: 1945
Aug - Sep 2011 2-month period	3.83" (97.28 mm)	6.25" (158.75 mm)	-2.42" (-61.47 mm)	19 th Driest 99 th Wettest	Driest since: 2000 Wettest since: 2010	Driest: 2000 Wettest: 1974
Jul - Sep 2011 3-month period	4.54" (115.32 mm)	9.10" (231.14 mm)	-4.56" (-115.82 mm)	6 th Driest 111 st Wettest <i>Ties: 1900</i>	Driest since: 2000 Wettest since: 2010	Driest: 1954 Wettest: 1996
Jun - Sep 2011 4-month period	5.67" (144.02 mm)	13.14" (333.76 mm)	-7.47" (-189.74 mm)	2 nd Driest 116 th Wettest	Driest since: 1954 Wettest since: 2010	Driest: 1954 Wettest: 1945
May - Sep 2011 5-month period	9.74" (247.40 mm)	18.04" (458.22 mm)	-8.30" (-210.82 mm)	1 st Driest 117 th Wettest	Driest to Date Wettest since: 2010	Driest: 2011 Wettest: 2007
Apr - Sep 2011 6-month period	13.07" (331.98 mm)	21.44" (544.58 mm)	-8.37" (-212.60 mm)	2 nd Driest 116 th Wettest	Driest since: 1956 Wettest since: 2010	Driest: 1956 Wettest: 1957
Mar - Sep 2011 7-month period	13.78" (350.01 mm)	23.92" (607.57 mm)	-10.14" (-257.56 mm)	2 nd Driest 116 th Wettest	Driest since: 1956 Wettest since: 2010	Driest: 1956 Wettest: 1957
Feb - Sep 2011 8-month period	15.24" (387.10 mm)	25.56" (649.22 mm)	-10.32" (-262.12 mm)	2 nd Driest 116 th Wettest	Driest since: 1956 Wettest since: 2010	Driest: 1958 Wettest: 1957
Jan - Sep 2011 9-month period	15.59" (395.99 mm)	27.01" (686.05 mm)	-11.42" (-290.06 mm)	2 nd Driest 116 th Wettest	Driest since: 1956 Wettest since: 2010	Driest: 1956 Wettest: 1957
Dec 2010 - Sep 2011 10-month period	16.46" (418.08 mm)	28.73" (729.74 mm)	-12.27" (-311.66 mm)	2 nd Driest 115 th Wettest	Driest since: 1956 Wettest since: 2010	Driest: 1956 Wettest: 1957
Nov 2010 - Sep 2011 11-month period	18.33" (465.58 mm)	30.93" (785.62 mm)	-12.60" (-320.04 mm)	2 nd Driest 115 th Wettest	Driest since: 1956 Wettest since: 2010	Driest: 1958 Wettest: 2007
Oct 2010 - Sep 2011 12-month period	20.05" (509.27 mm)	33.95" (862.33 mm)	-13.90" (-353.06 mm)	2 nd Driest 115 th Wettest	Driest since: 1956 Wettest since: 2010	Driest: 1956 Wettest: 1973



2nd Most Intense Drought on Record for OK at the end of September 2011

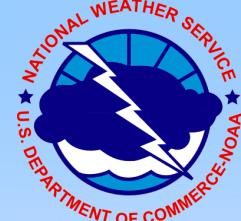
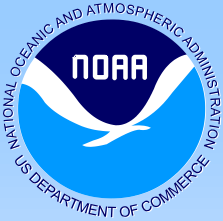


-5.86 PDSI second only to -7.5 in 1956.

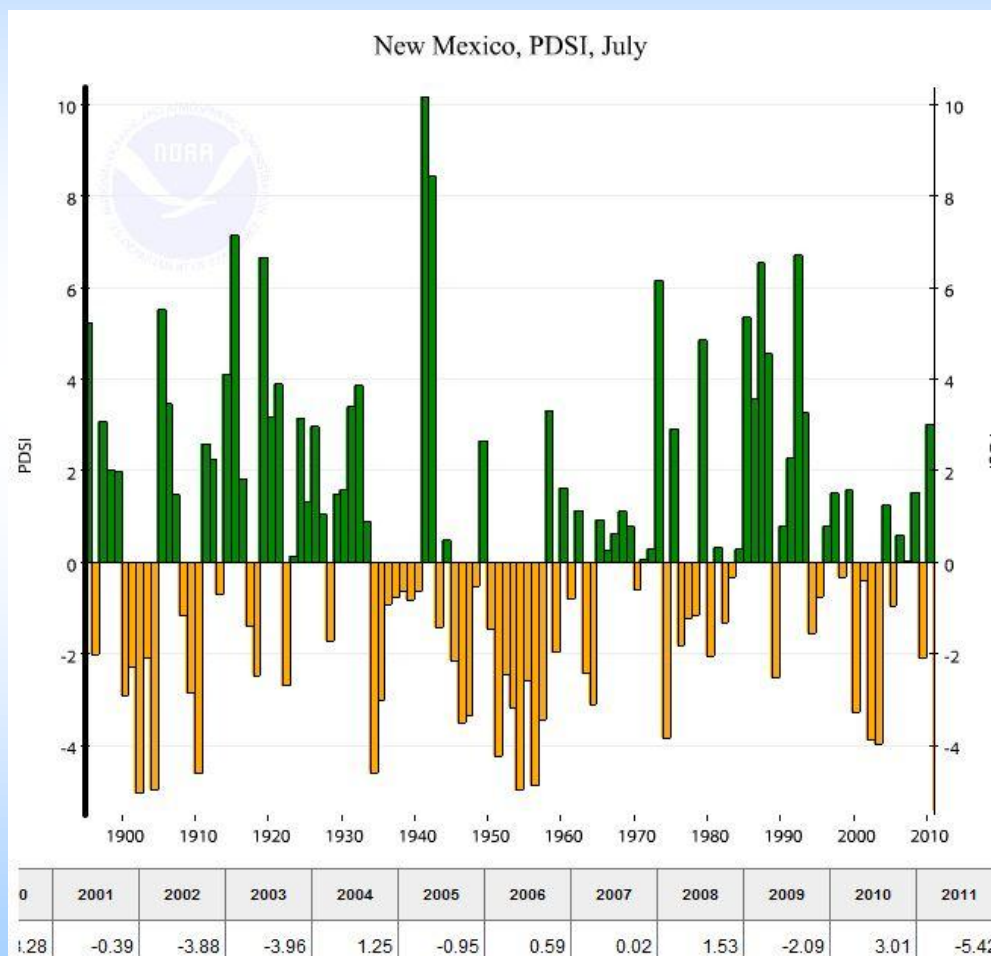


New Mexico at the end of July 2011

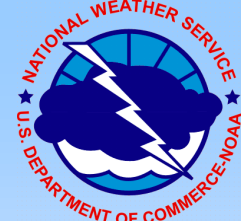
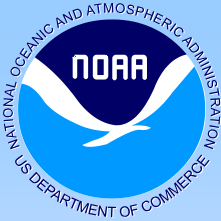
Period	Amount	20 th Century Average	Departure	Rank	Wettest/Driest Since	Record Year
Jul 2011 1-month period	1.44" (36.58 mm)	2.43" (61.72 mm)	-0.99" (-25.14 mm)	14 th Driest 104 th Wettest	Driest since: 2005 Wettest since: 2010	Driest: 2003 Wettest: 1914
Jun - Jul 2011 2-month period	1.61" (40.89 mm)	3.56" (90.42 mm)	-1.95" (-49.53 mm)	3 rd Driest 115 th Wettest	Driest since: 2005 Wettest since: 2010	Driest: 1980 Wettest: 1921
May - Jul 2011 3-month period	1.86" (47.24 mm)	4.56" (115.82 mm)	-2.70" (-68.58 mm)	1 st Driest 117 th Wettest	Driest to Date Wettest since: 2010	Driest: 2011 Wettest: 1921
Apr - Jul 2011 4-month period	2.17" (55.12 mm)	5.26" (133.60 mm)	-3.09" (-78.48 mm)	1 st Driest 117 th Wettest	Driest to Date Wettest since: 2010	Driest: 2011 Wettest: 1941
Mar - Jul 2011 5-month period	2.32" (58.93 mm)	5.95" (151.13 mm)	-3.63" (-92.20 mm)	1 st Driest 117 th Wettest	Driest to Date Wettest since: 2010	Driest: 2011 Wettest: 1941
Feb - Jul 2011 6-month period	2.67" (67.82 mm)	6.51" (165.35 mm)	-3.84" (-97.53 mm)	1 st Driest 117 th Wettest	Driest to Date Wettest since: 2010	Driest: 2011 Wettest: 1941
Jan - Jul 2011 7-month period	2.75" (69.85 mm)	7.11" (180.59 mm)	-4.36" (-110.74 mm)	1 st Driest 117 th Wettest	Driest to Date Wettest since: 2010	Driest: 2011 Wettest: 1941
Dec 2010 - Jul 2011 8-month period	3.54" (89.92 mm)	7.80" (198.12 mm)	-4.26" (-108.20 mm)	1 st Driest 116 th Wettest	Driest to Date Wettest since: 2010	Driest: 2011 Wettest: 1941
Nov 2010 - Jul 2011 9-month period	3.63" (92.20 mm)	8.39" (213.11 mm)	-4.76" (-120.91 mm)	1 st Driest 116 th Wettest	Driest to Date Wettest since: 2010	Driest: 2011 Wettest: 1941
Oct 2010 - Jul 2011 10-month period	4.43" (112.52 mm)	9.54" (242.32 mm)	-5.11" (-129.80 mm)	1 st Driest 116 th Wettest	Driest to Date Wettest since: 2010	Driest: 2011 Wettest: 1941
Sep 2010 - Jul 2011 11-month period	5.91" (150.11 mm)	11.13" (282.70 mm)	-5.22" (-132.59 mm)	1 st Driest 116 th Wettest	Driest to Date Wettest since: 2010	Driest: 2011 Wettest: 1941
Aug 2010 - Jul 2011 12-month period	8.15" (207.01 mm)	13.51" (343.15 mm)	-5.36" (-136.14 mm)	3 rd Driest 114 th Wettest	Driest since: 1974 Wettest since: 2010	Driest: 1974 Wettest: 1941



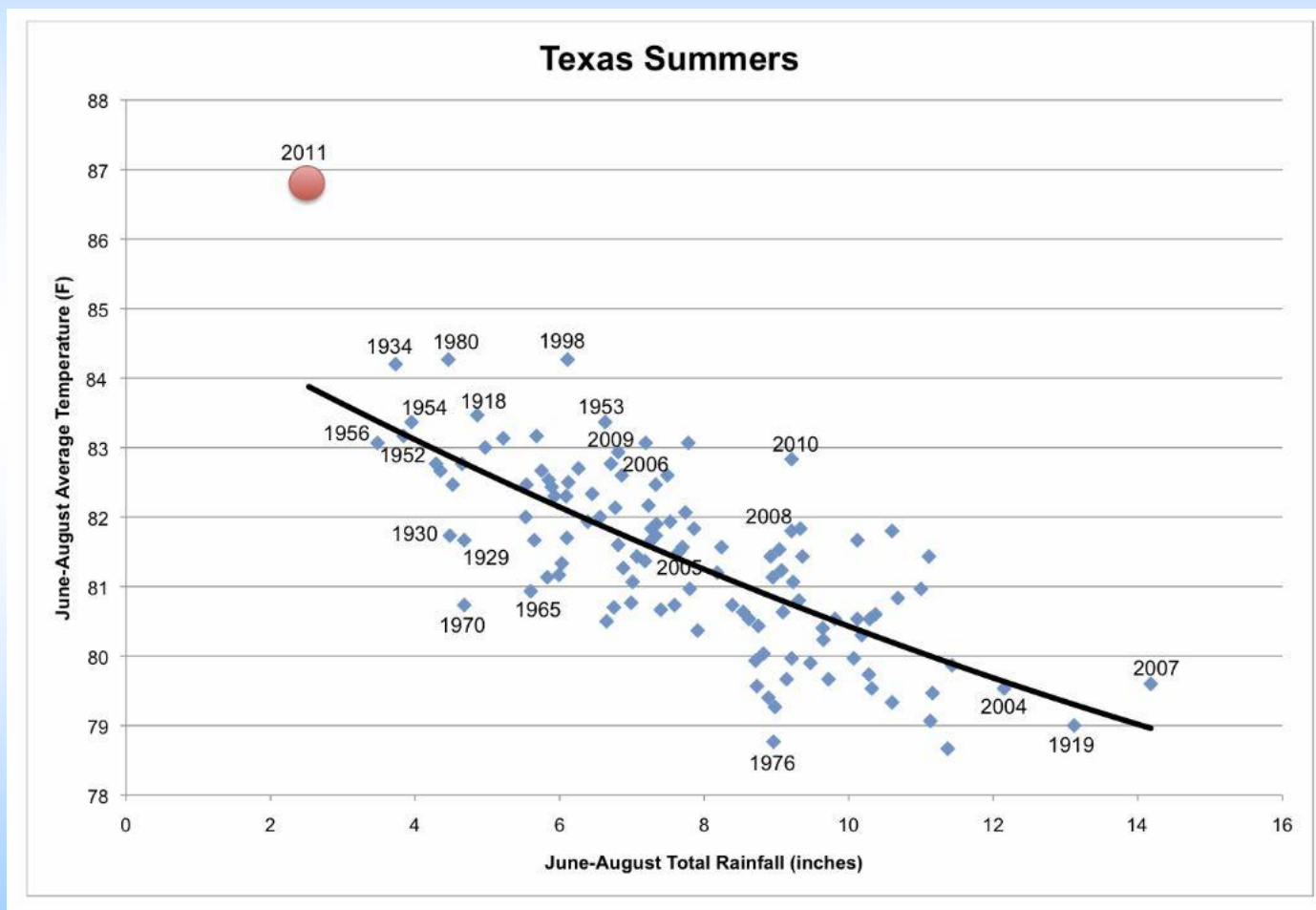
Most Intense 1 Year Drought on Record for NM at the end of July.



PDSI of -5.42 the lowest ever for end of July.

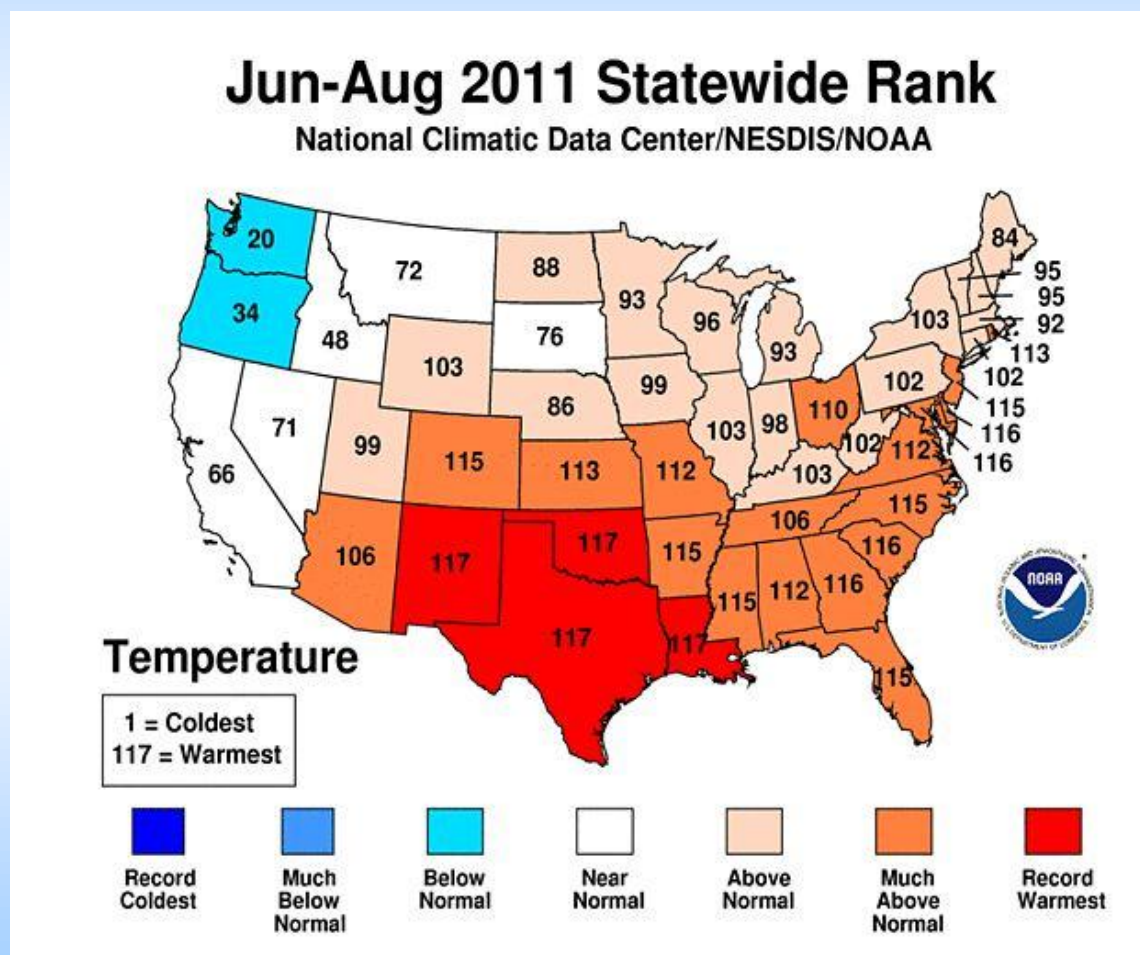


With the Drought Came the Summertime Heat. A Historically Unparalleled Combination



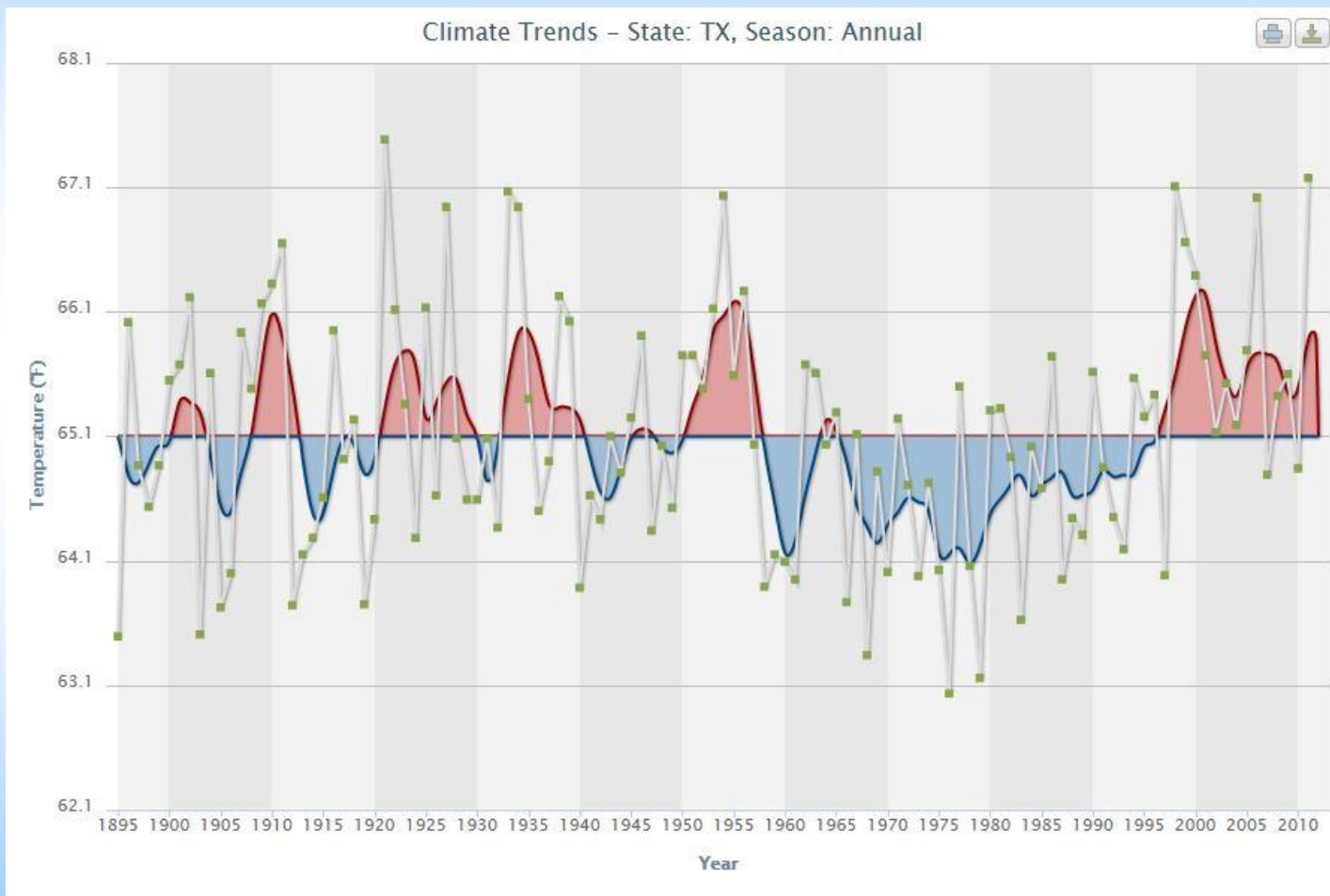
Graph Compiled by Prof. John Nielsen-Gammon.

Oklahoma, Texas, Louisiana, and New Mexico all had their Hottest Summers Ever on Record.

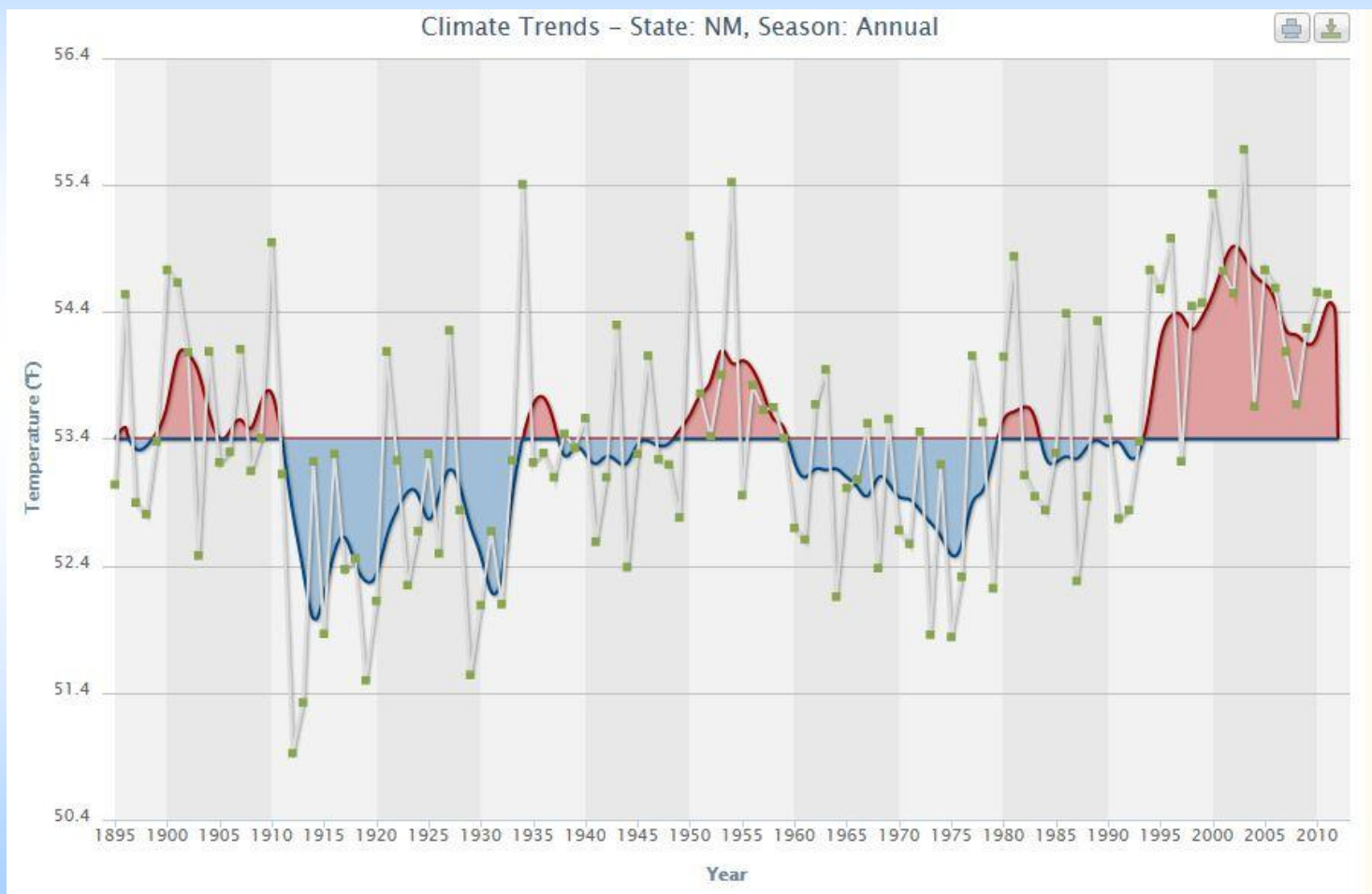


OK had #1 hottest summer ever since 1895 for US state, with TX having the #2 hottest summer ever and LA the #4 hottest summer ever.

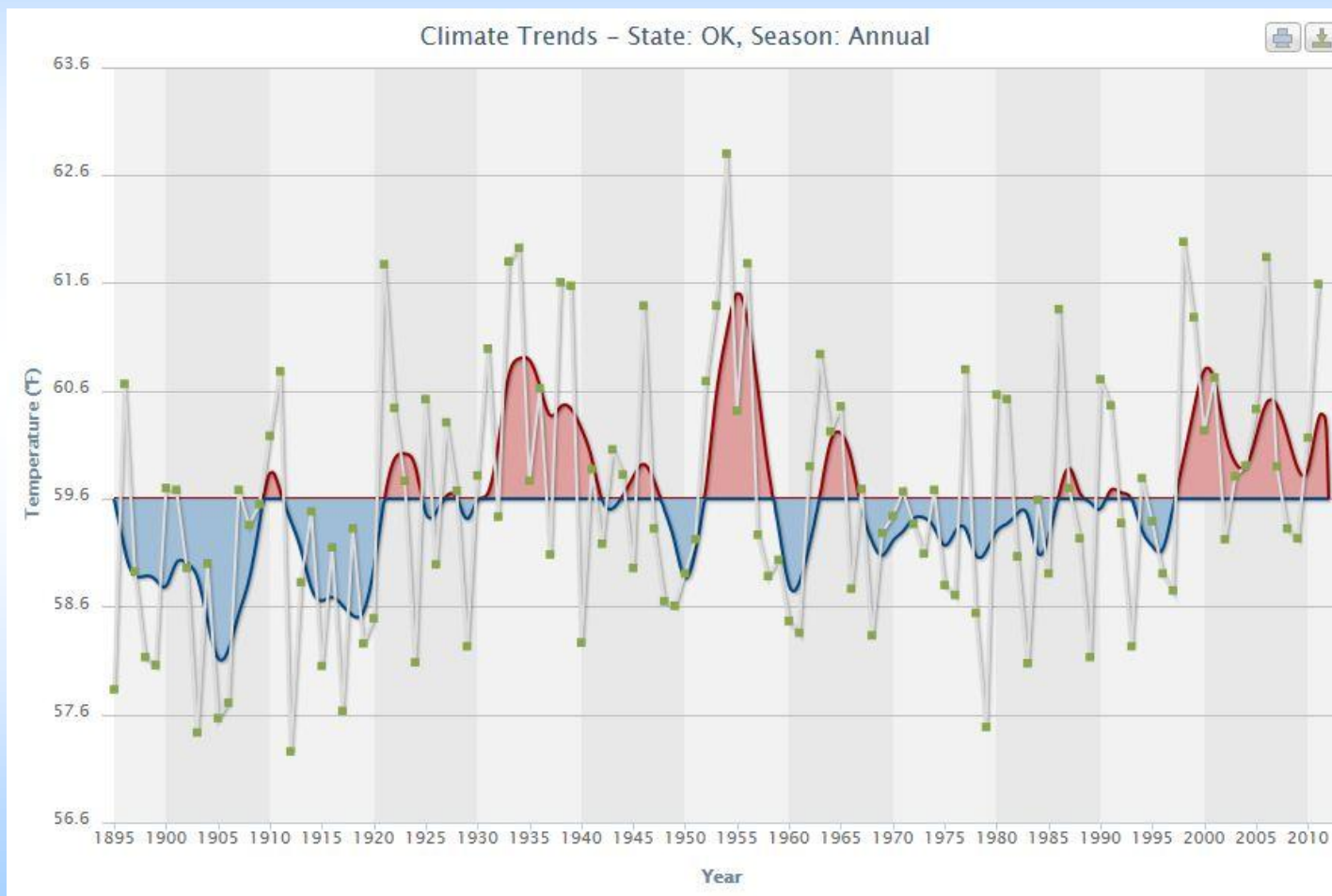
Yearly Observed Average Temperature in TX with a 5 year Rolling Average



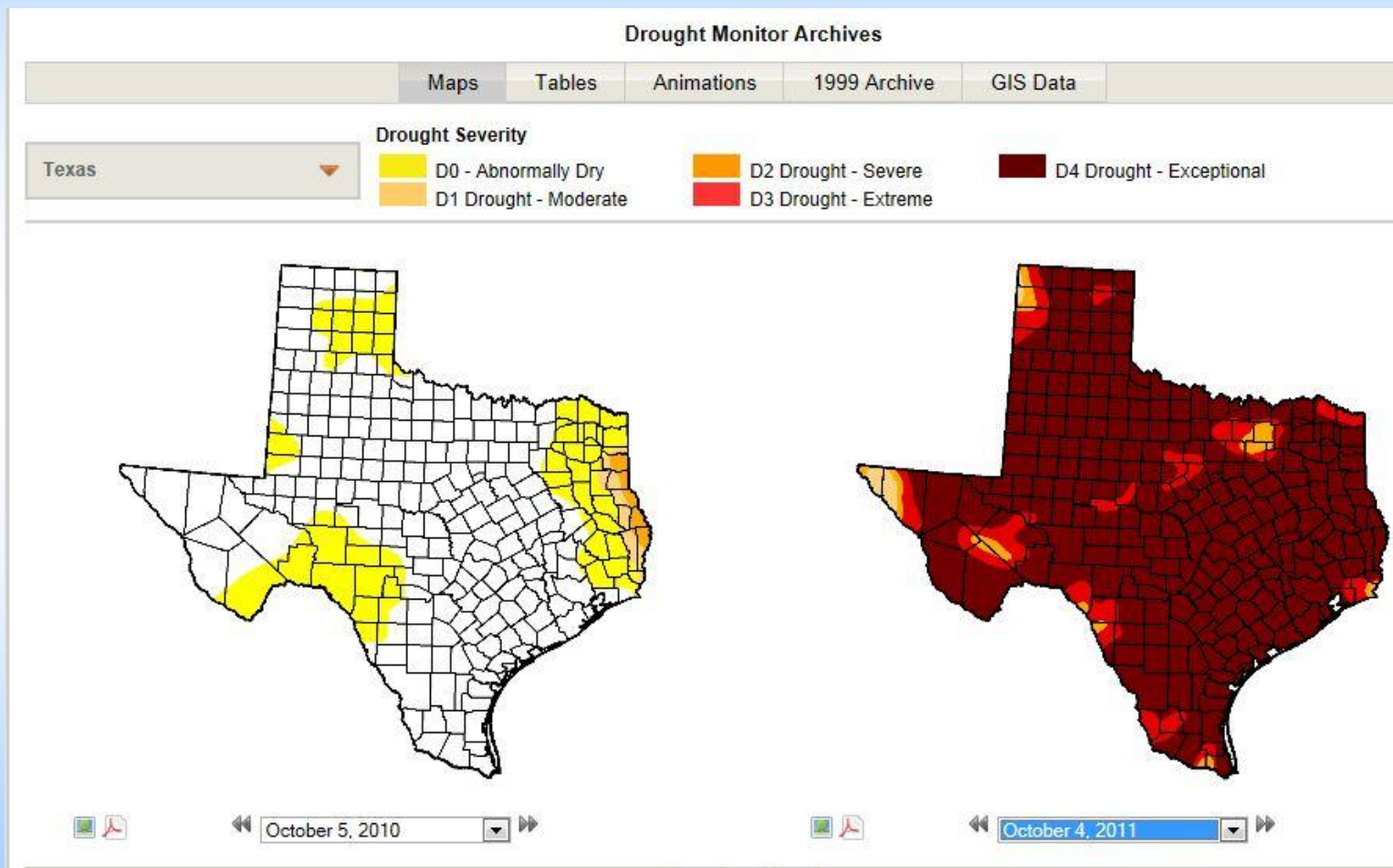
Yearly Observed Average Temperature in NM with a 5 year Rolling Average



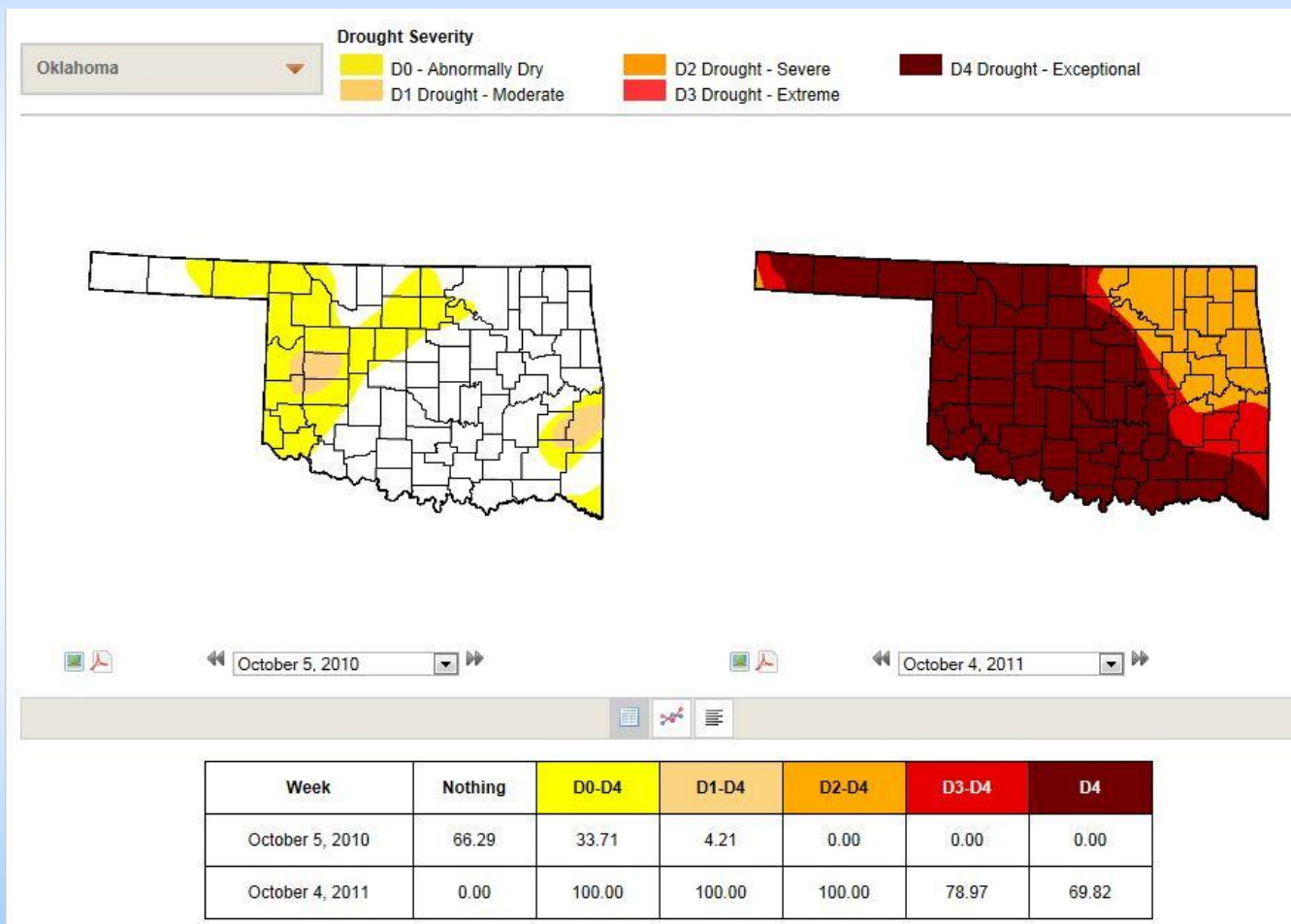
Yearly Observed Average Temperature in OK with a 5 year Rolling Average



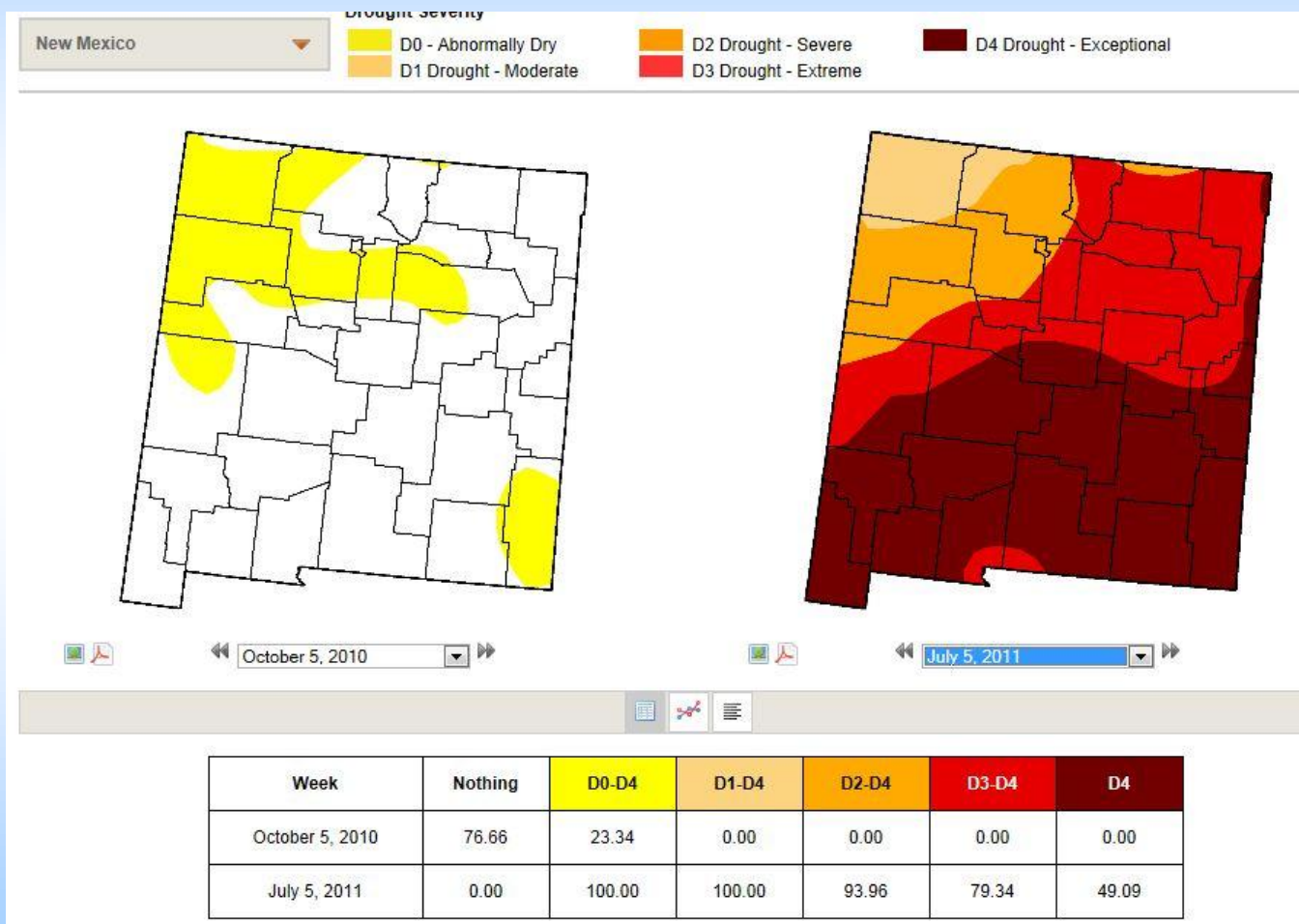
88% of TX in Exceptional Drought (D4) status on 10/4/11.

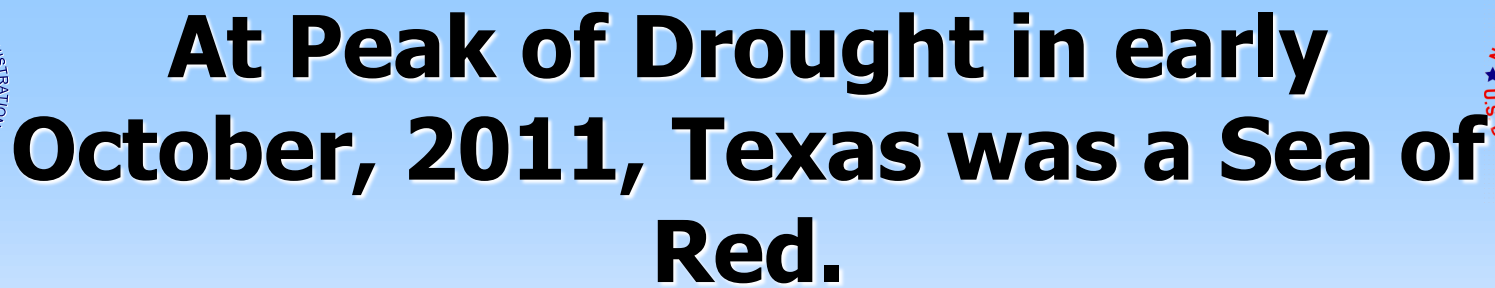


70% of Oklahoma in D4 status on 10/4/11





49% of NM in D4 status on 7/5/11.





TEXAS
FOREST SERVICE
The Texas A&M University System

 Counties without Established Burn Bans
 Counties with Established Burn Bans

DISCLAIMER

County burning bans are established by County Judges and or County Commissioners Courts. The Texas Forest Service is not responsible for establishing or removing burning bans. The Texas Forest Service is only displaying this information as a public service.

For More Information Please Contact
Your Local County Judge's Office

Counties with Burn Bans: 250

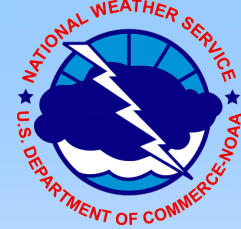
[illegible]

Burn Ban RSS feed available at <http://tfsfrp.tamu.edu/wildfires/BurnBan.xml>

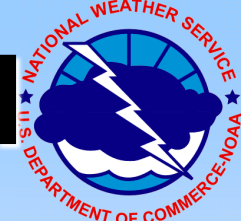
250 of 254 counties had burn bans in effect.



Texas Forest Service: "2011 was the worst year ever in TX for Wildfires."



- Over 4 million acres burned by wildfires in TX, or an area the size of Rhode Island and Connecticut combined.
- Over 2800 houses destroyed and over 2700 other structures destroyed.
- 10 fatalities.



Cumulative Acres Burned by Wildfire in TX.

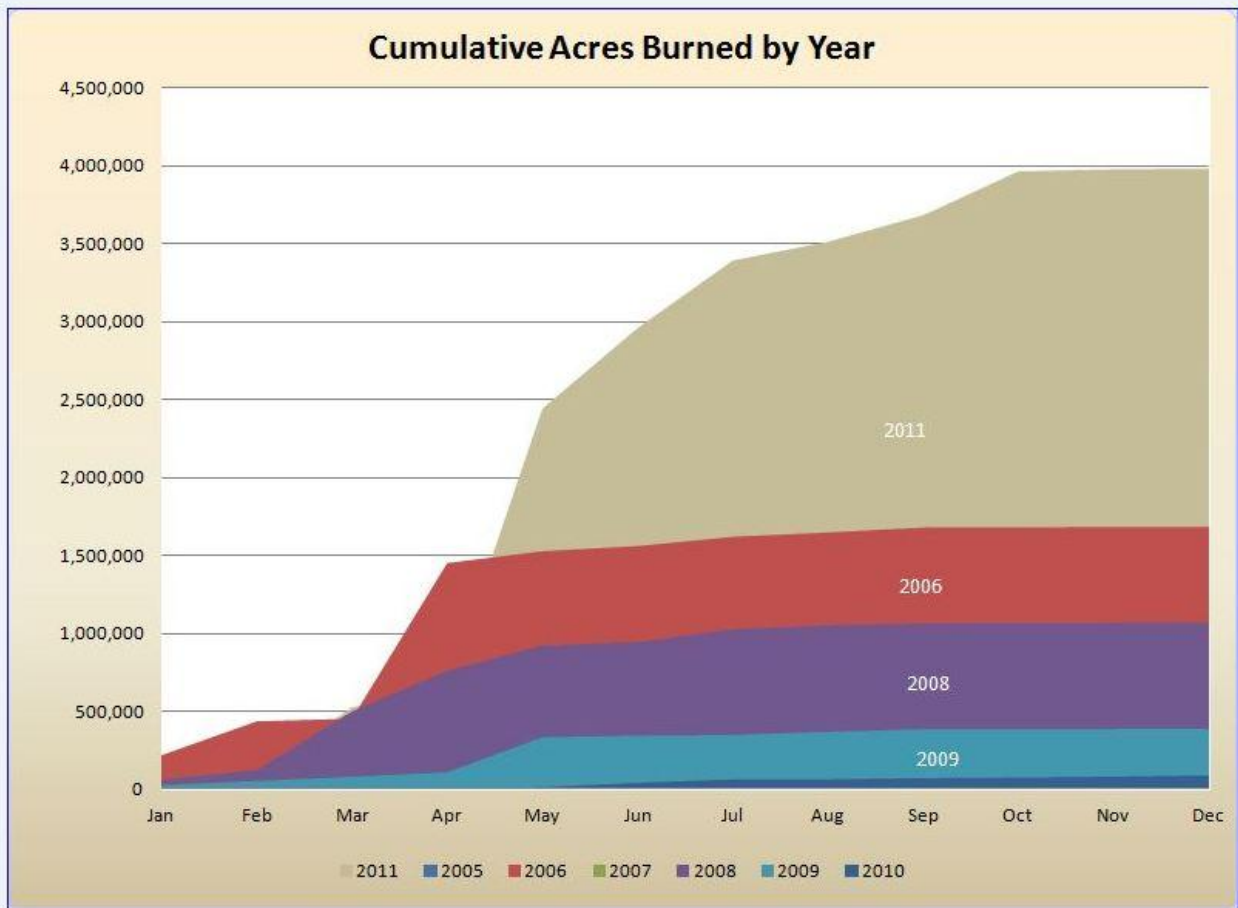
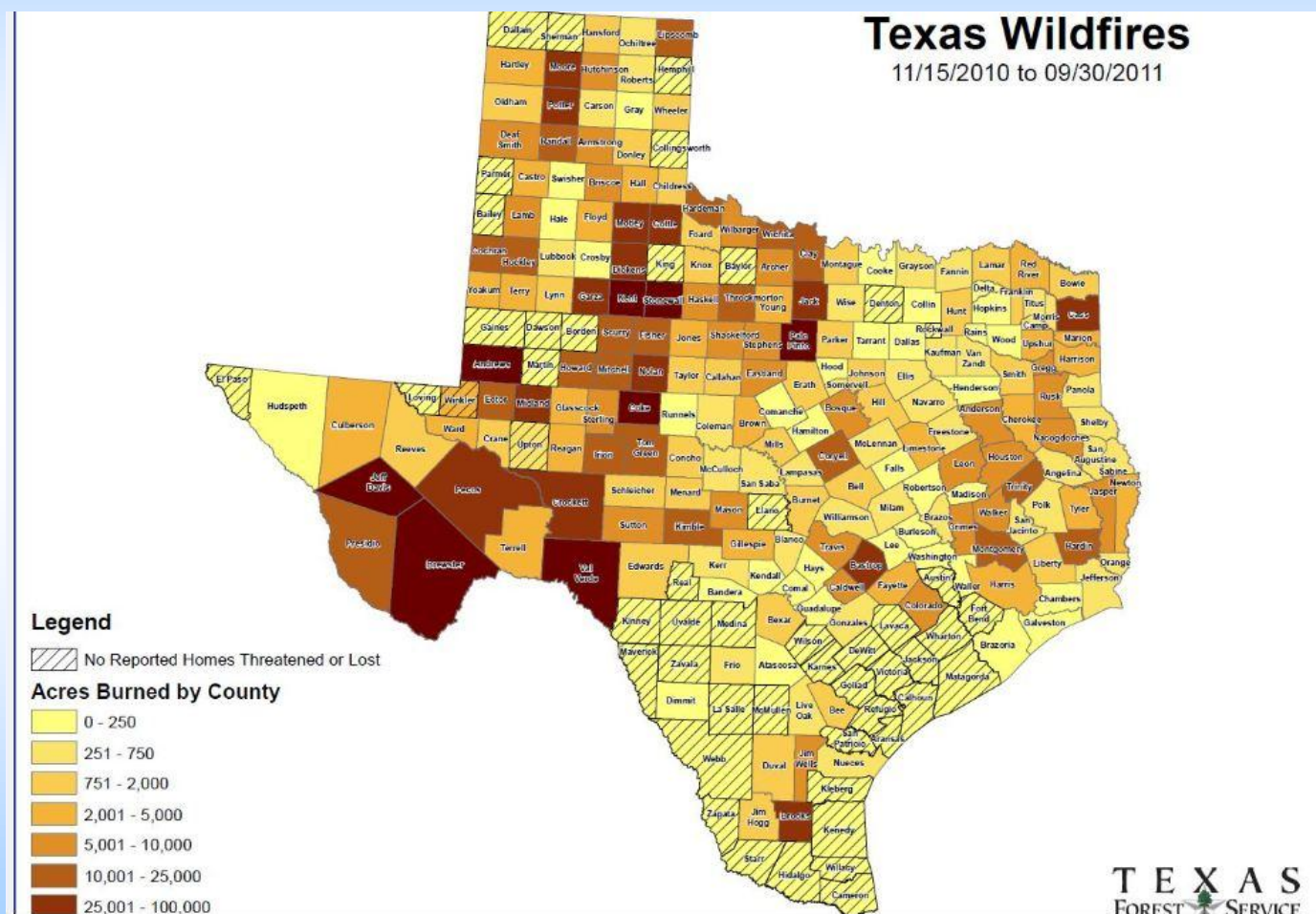
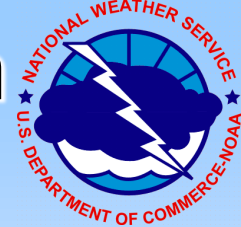
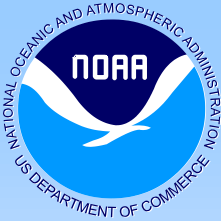


Image courtesy of Texas Forest Service

Drought and Wildfires were Indiscriminant in 2011.



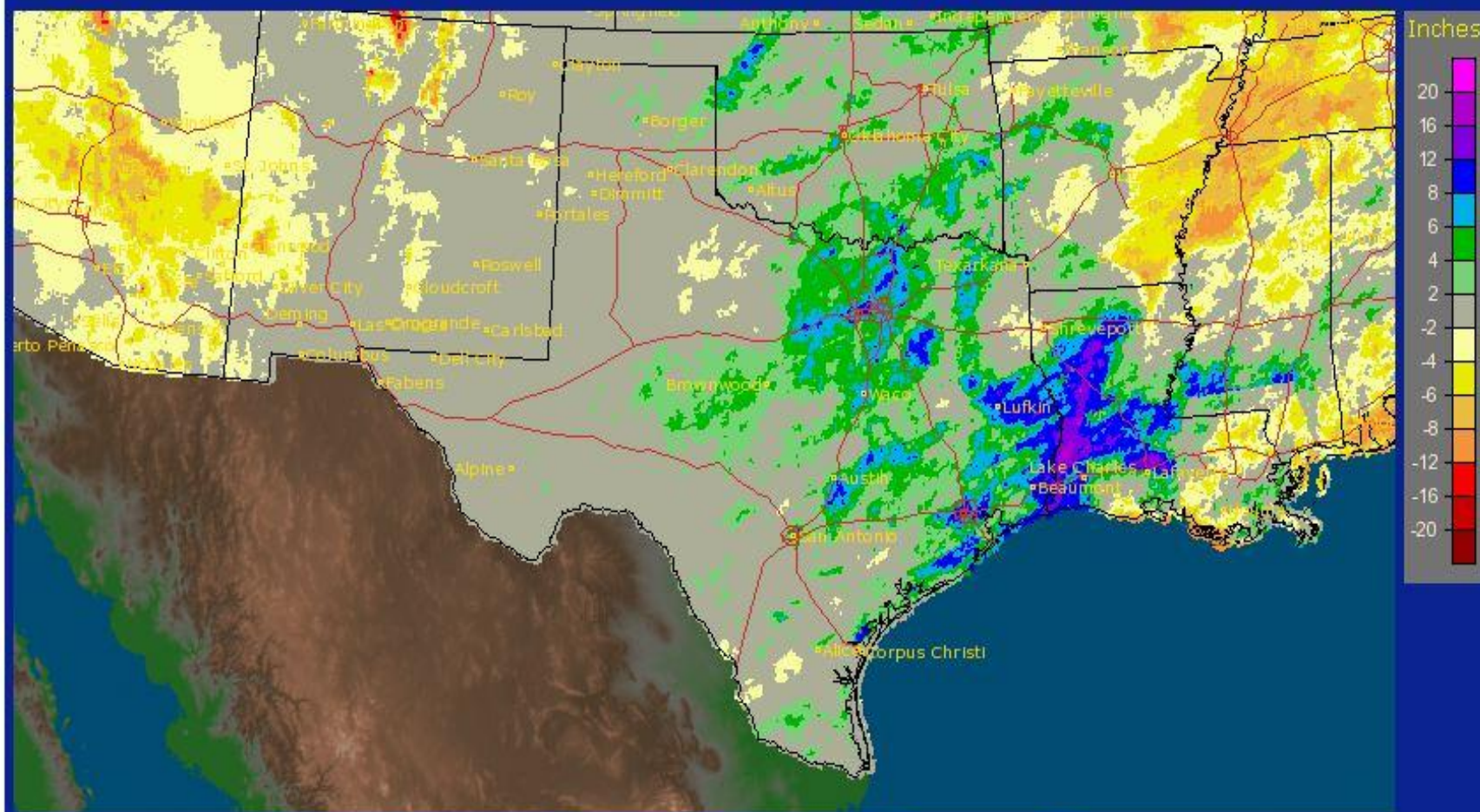


Total Losses of Over \$10 Billion in Texas Caused by Drought and Wildfires.

- March 2012 analysis by the Texas AgriLife Extension Service estimates livestock losses of \$3.2B and crop losses of \$4.4B, for a total loss of \$7.6B
- Cotton the hardest hit with \$2.2B
- Lost hay production next at \$750M.
- Additional losses caused by wildfires pegged at an additional \$5B in lost grazing land and destroyed structures.

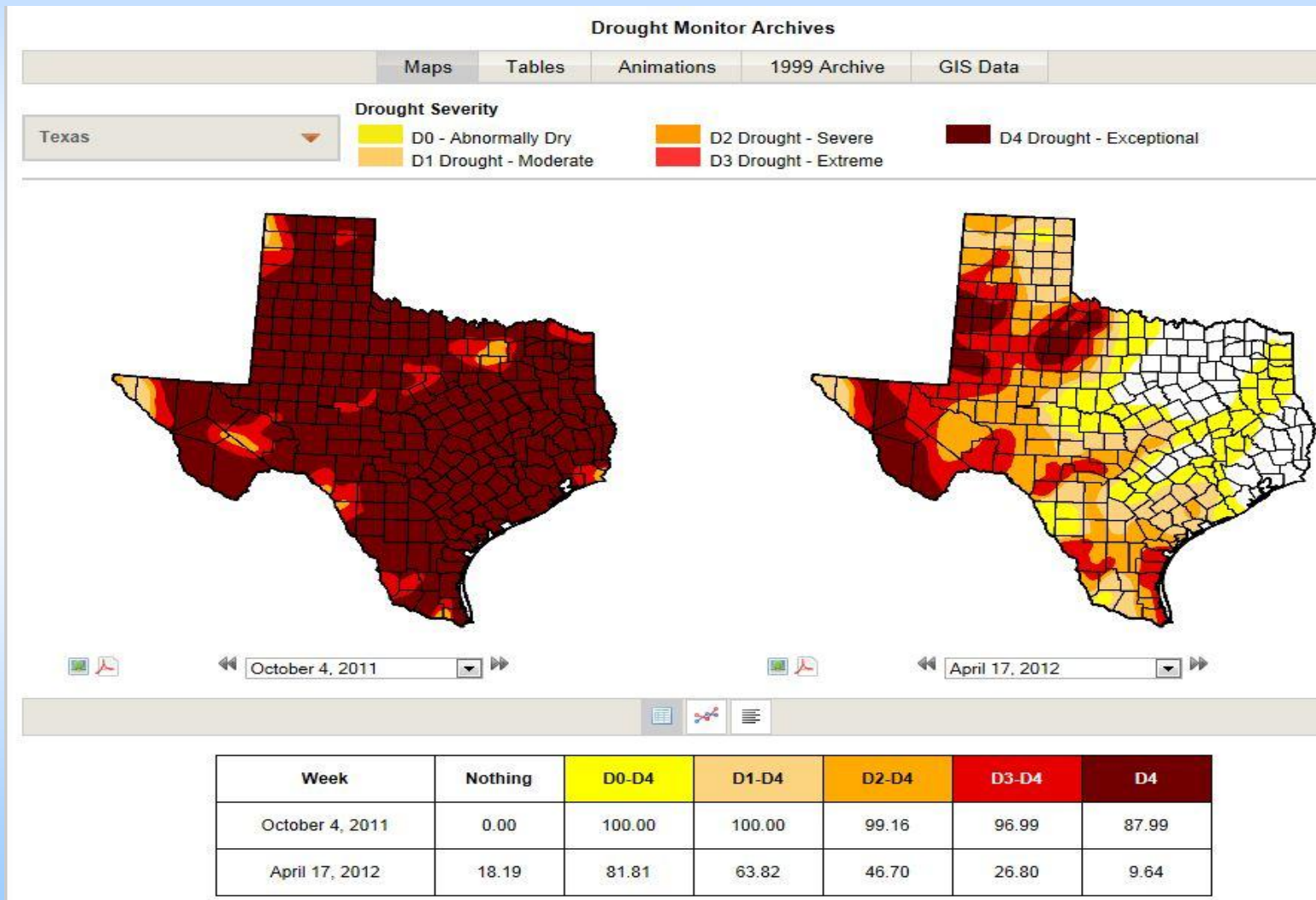
Nearly all of TX, OK, and eastern NM has seen normal to above normal precipitation in 2012.

Texas: Current Year to Date Departure from Normal Precipitation
Valid at 4/19/2012 1200 UTC - Created 4/19/12 17:48 UTC



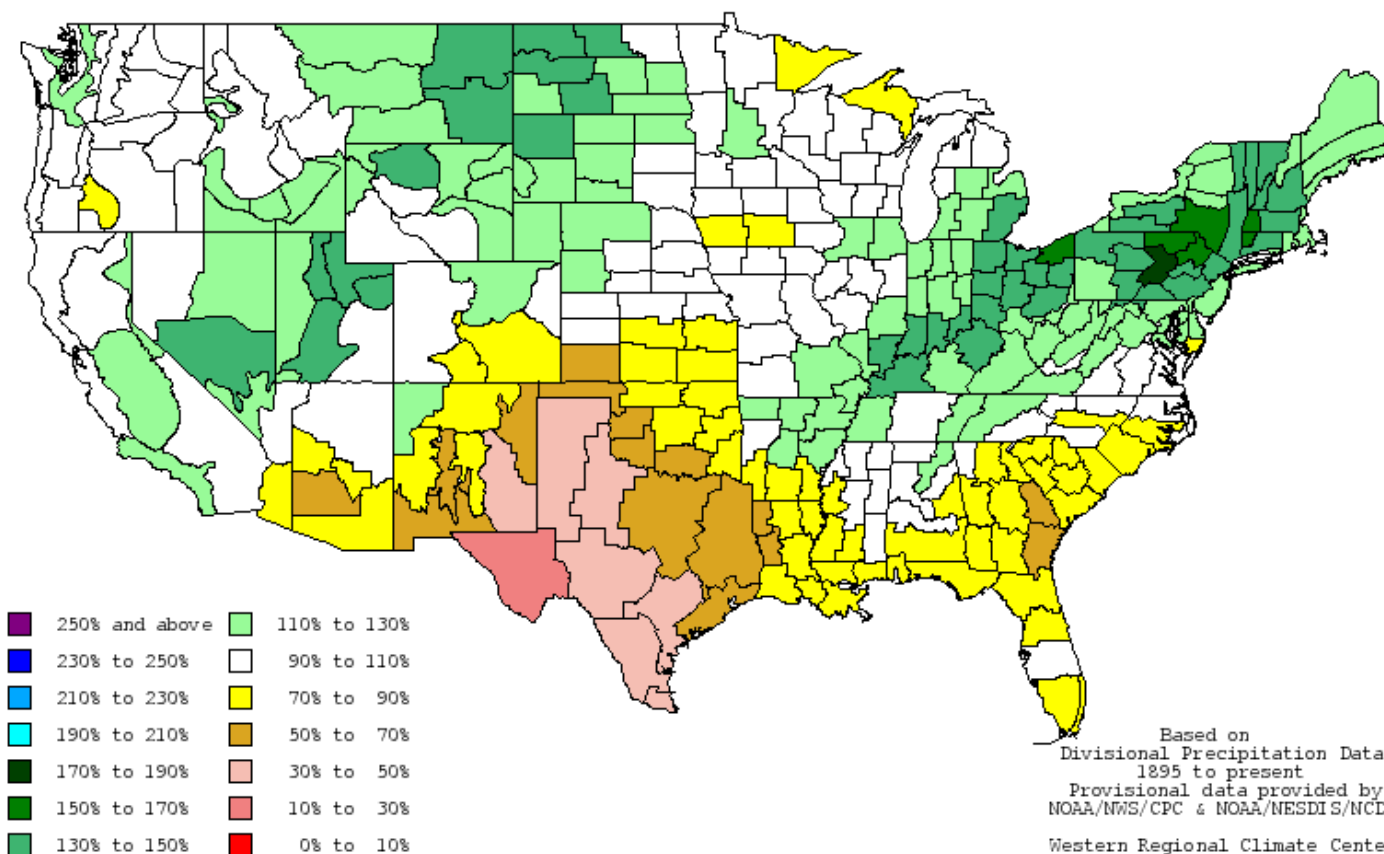
☒ Topo ☒ Pcpn Amount ☐ Counties ☐ Rivers ☒ States ☒ Highway/City ☐ RFC Boundary

Considerable Improvement in the Past 6 Months, Despite the 2nd Round of La Nina, but...



15 Month Percent of Avg. Precipitation Through December 2011. Far West TX below 30%.

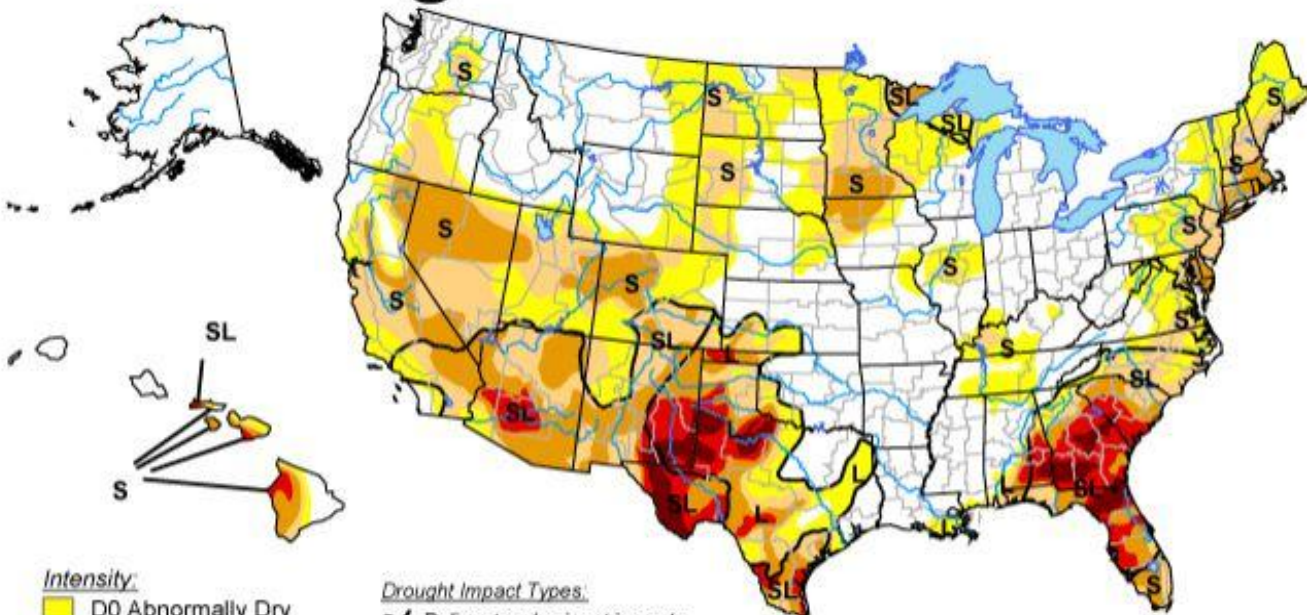
15-month Percent of Average Precipitation through the end of December 2011



Areas with most pronounced precipitation deficit have still not recovered from drought.

U.S. Drought Monitor

April 17, 2012
Valid 7 a.m. EDT



Intensity:

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

Drought Impact Types:

- Delineates dominant impacts
- S = Short-Term, typically <6 months
(e.g. agriculture, grasslands)
- L = Long-Term, typically >6 months
(e.g. hydrology, ecology)

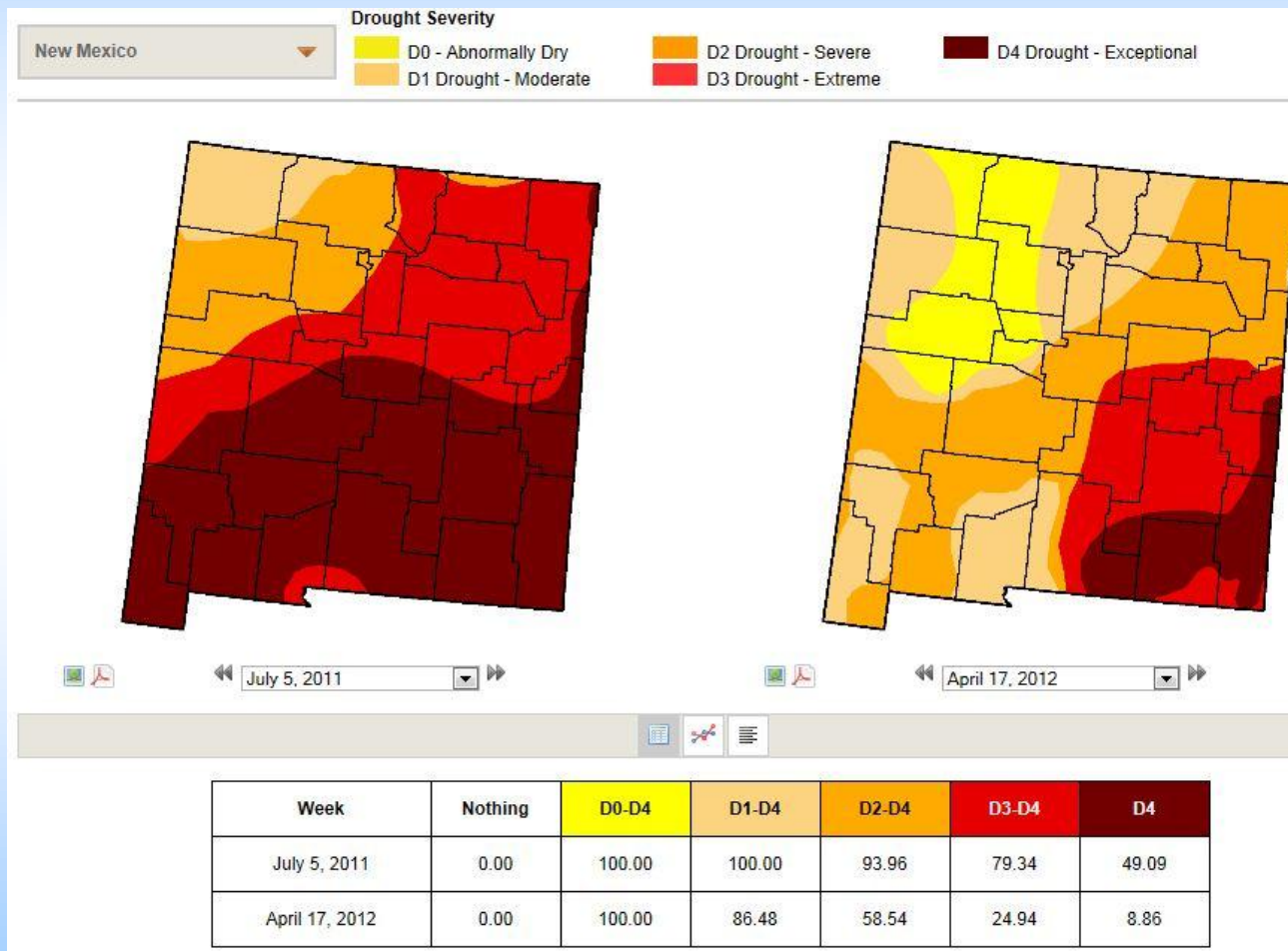
The Drought Monitor focuses on broad-scale conditions.
Local conditions may vary. See accompanying text summary
for forecast statements.

<http://droughtmonitor.unl.edu/>

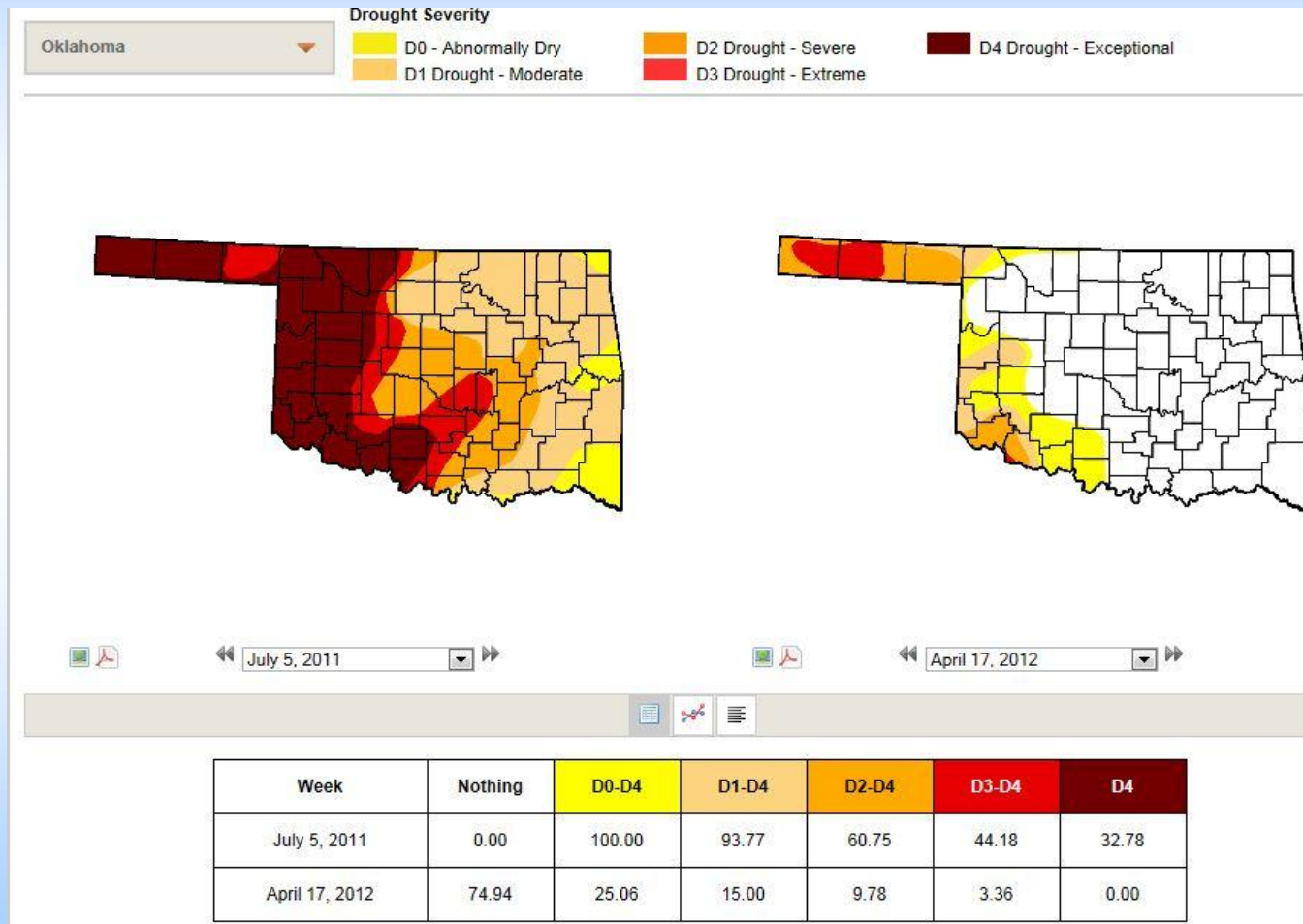


Released Thursday, April 19, 2012
Author: Anthony Artusa, NOAA/NWS/NCEP/CPC

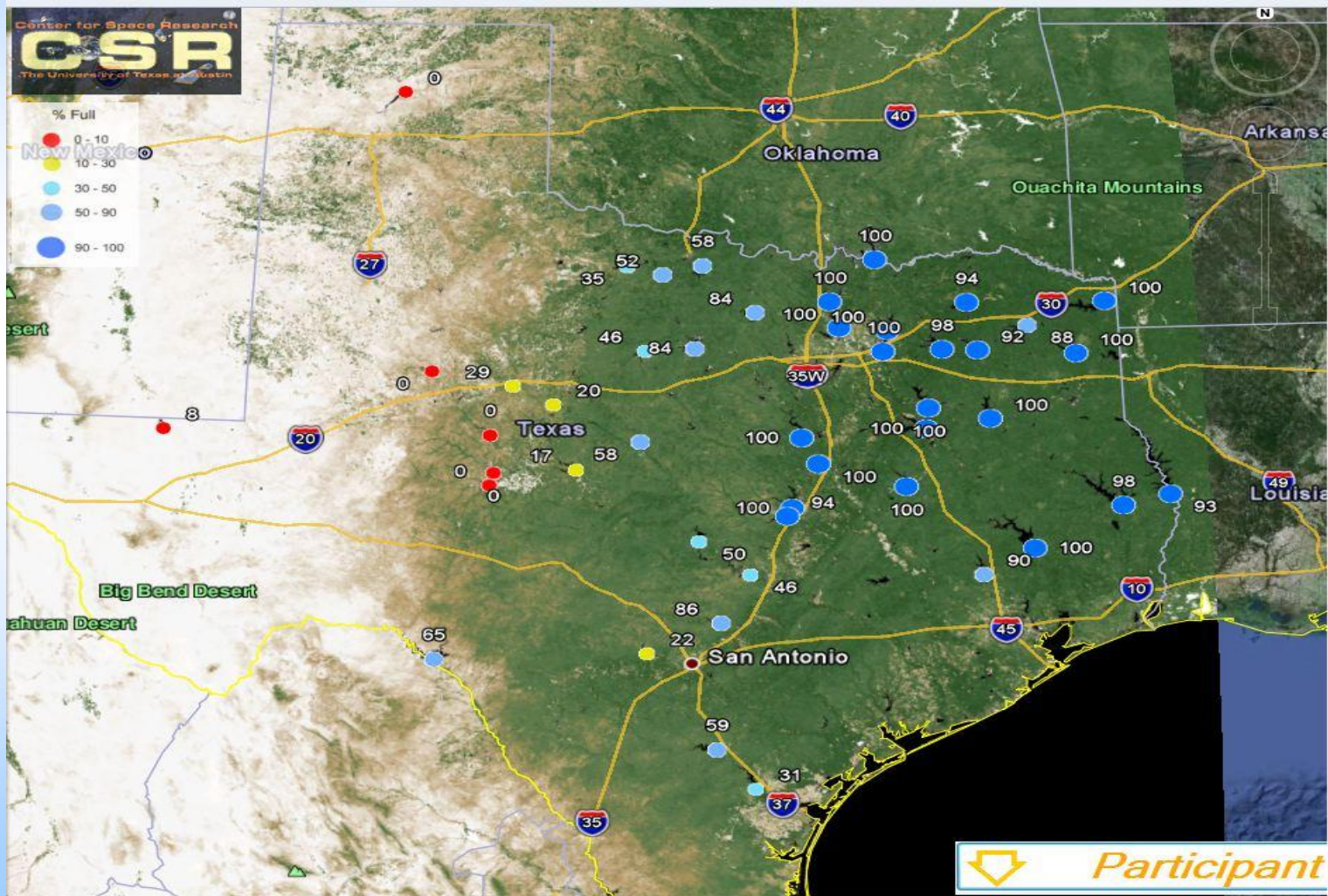
Some Improvement in the past 6 Months Despite the 2nd Round of La Nina.



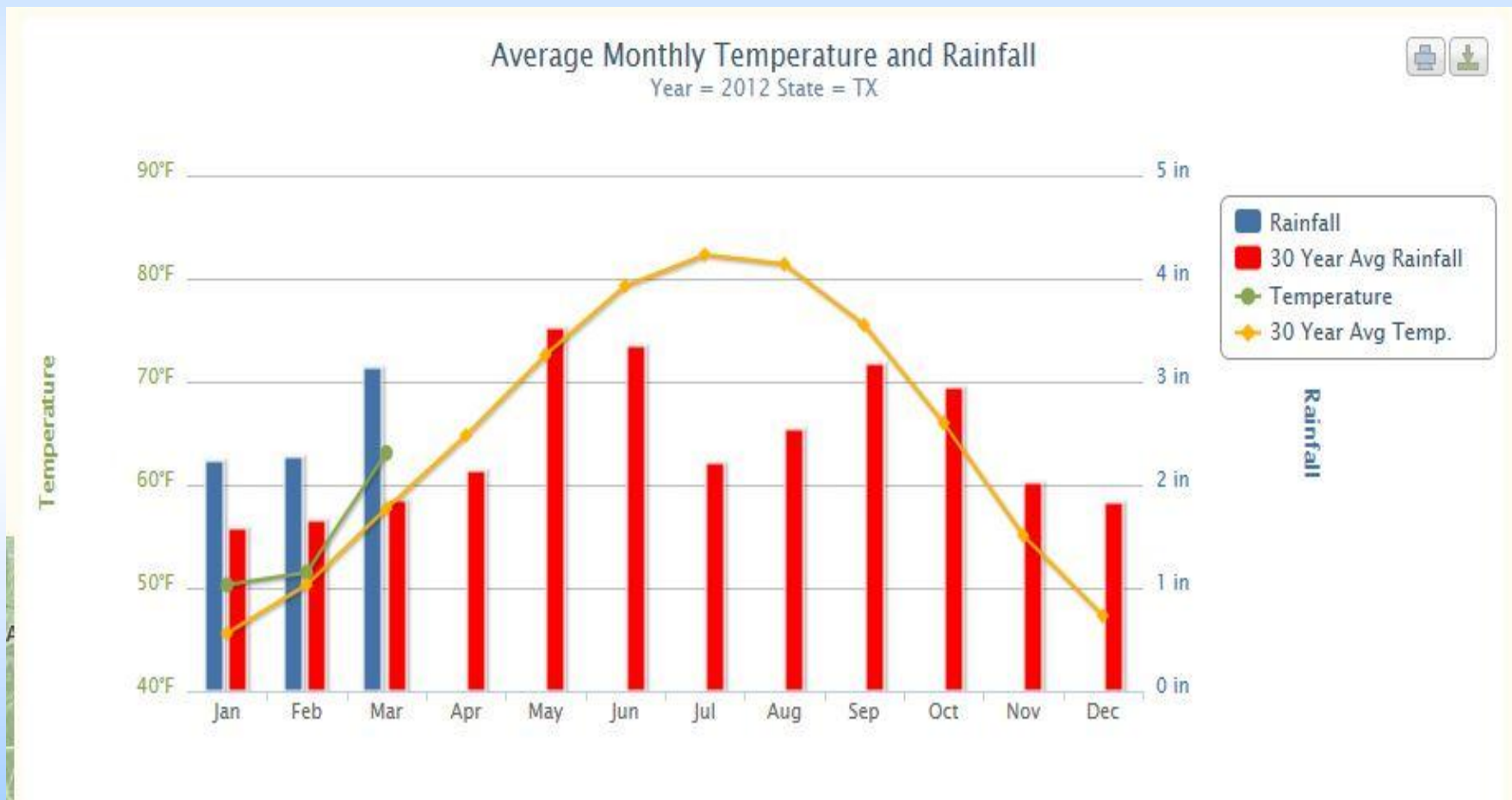
Marked Improvement in the past 6 Months Despite the 2nd Round of La Nina



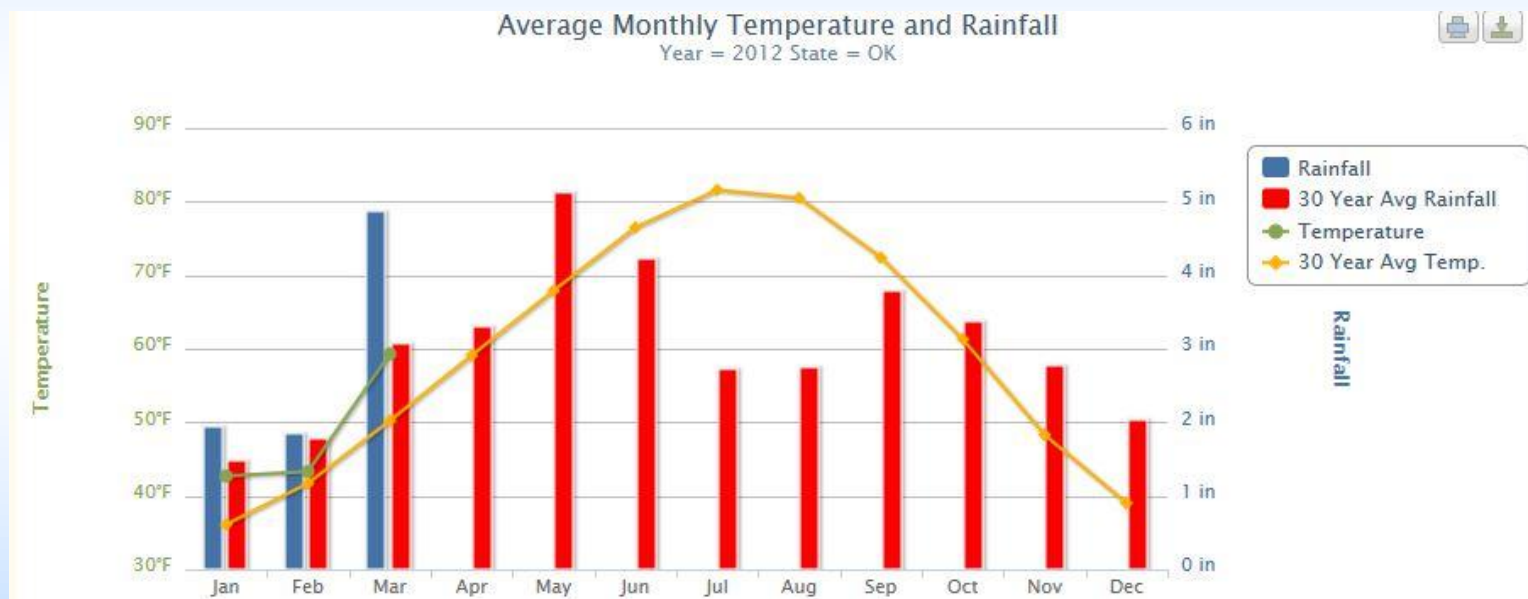
Main Concern Now: Reservoir Levels in West TX.



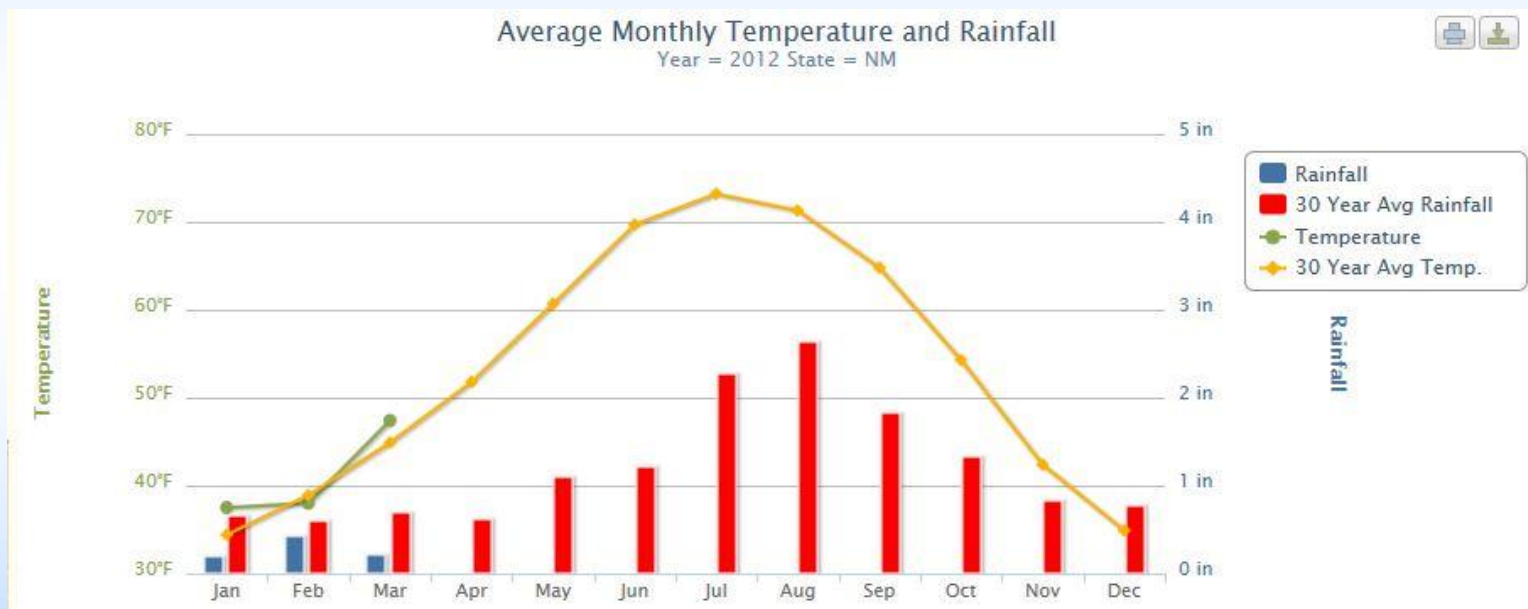
Moving Into our Wettest Time of the Year Gives Hope for Continued Improvements in TX

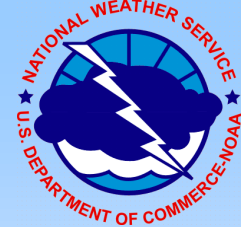
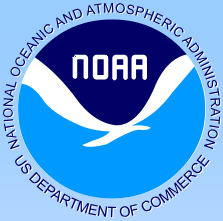


May and June are the two wettest months of the year in OK, so drought improvement should continue.

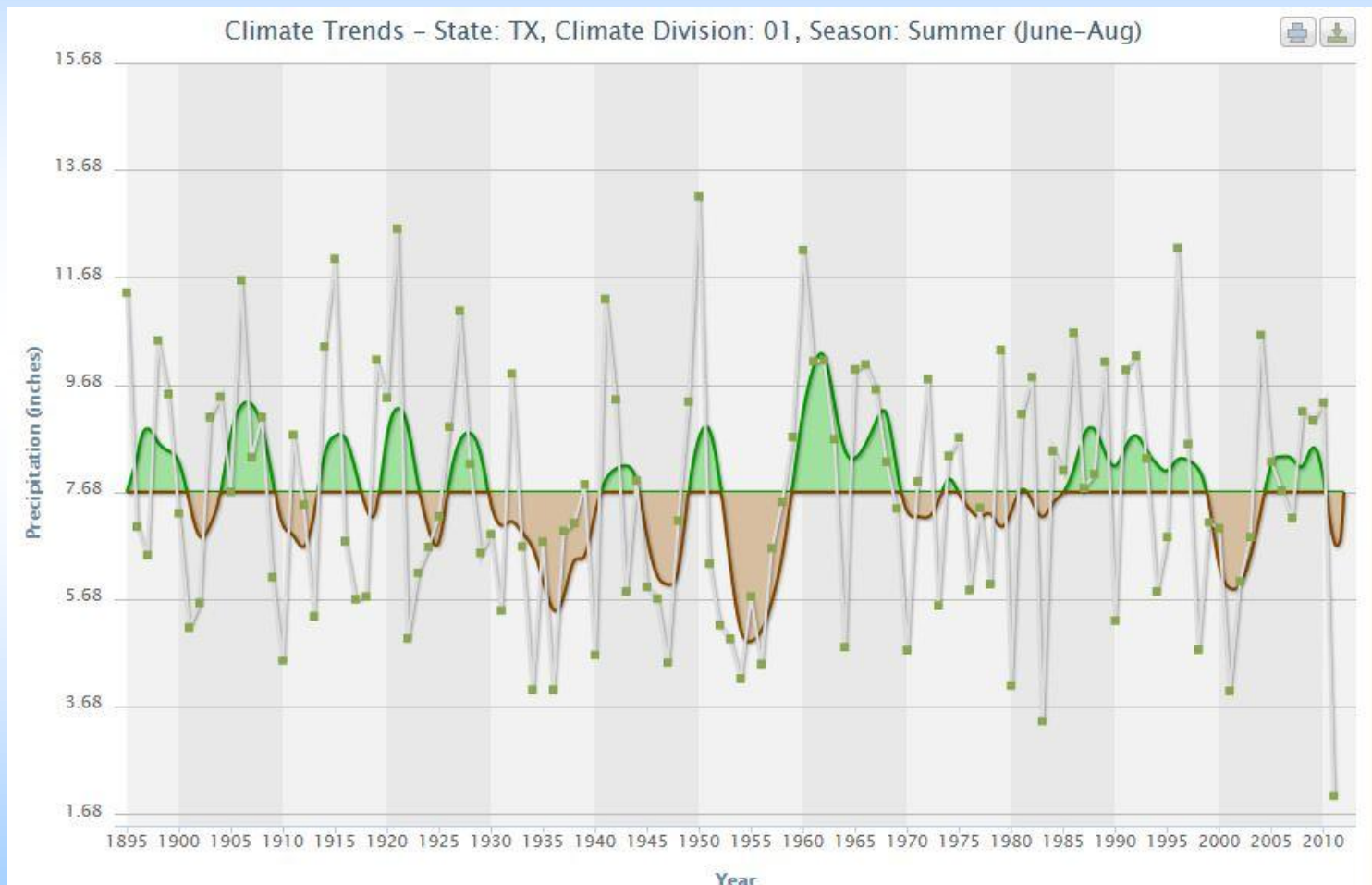


Having an Active Monsoon Season in July and August will determine long term drought situation for NM. Nearly 50% (6.75") of the yearly NM precip total (13.5") falls in Jul/Aug/Sep.

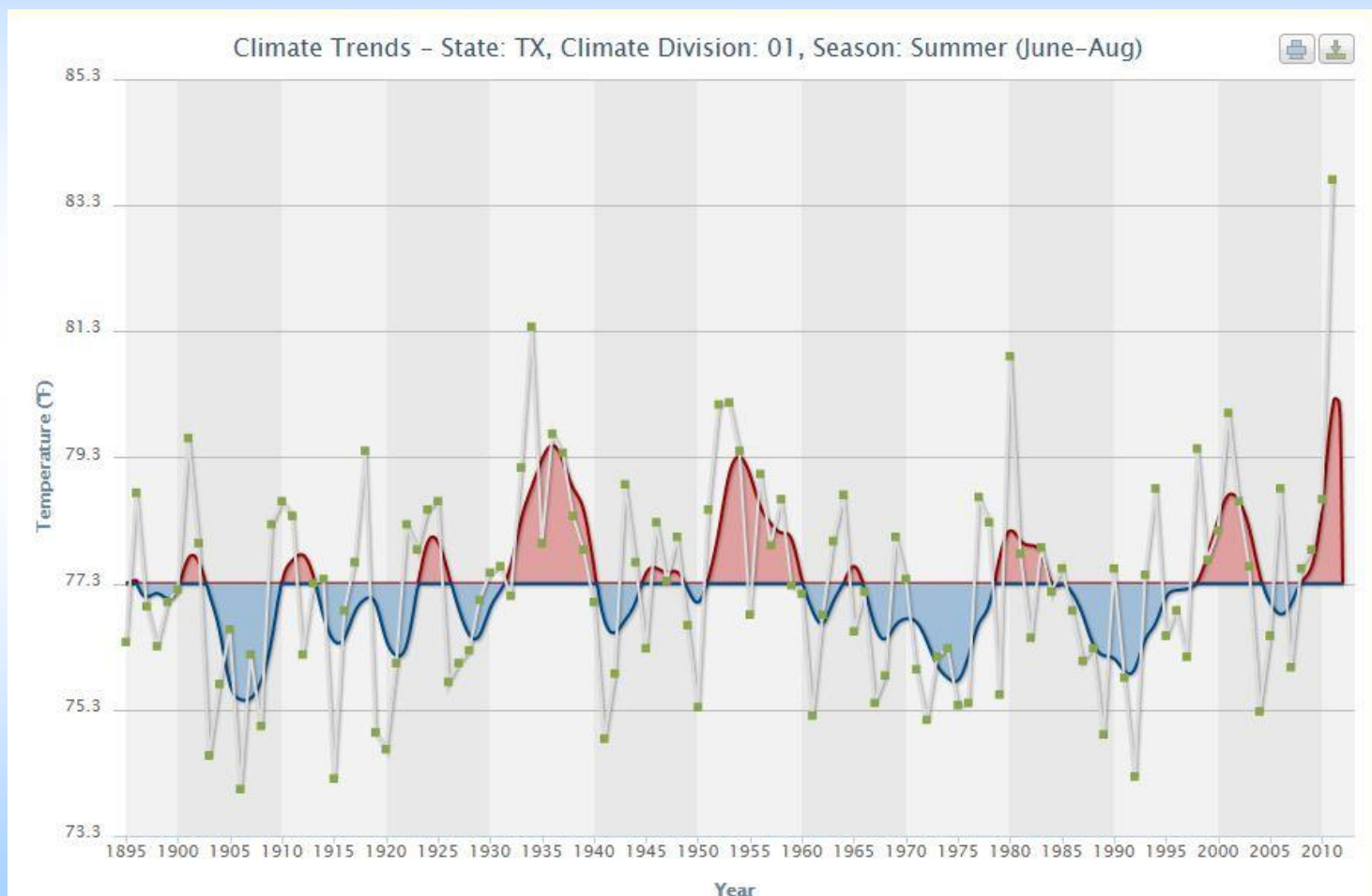


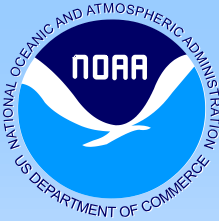


Record Dry Summer in TX High Plains in 2011

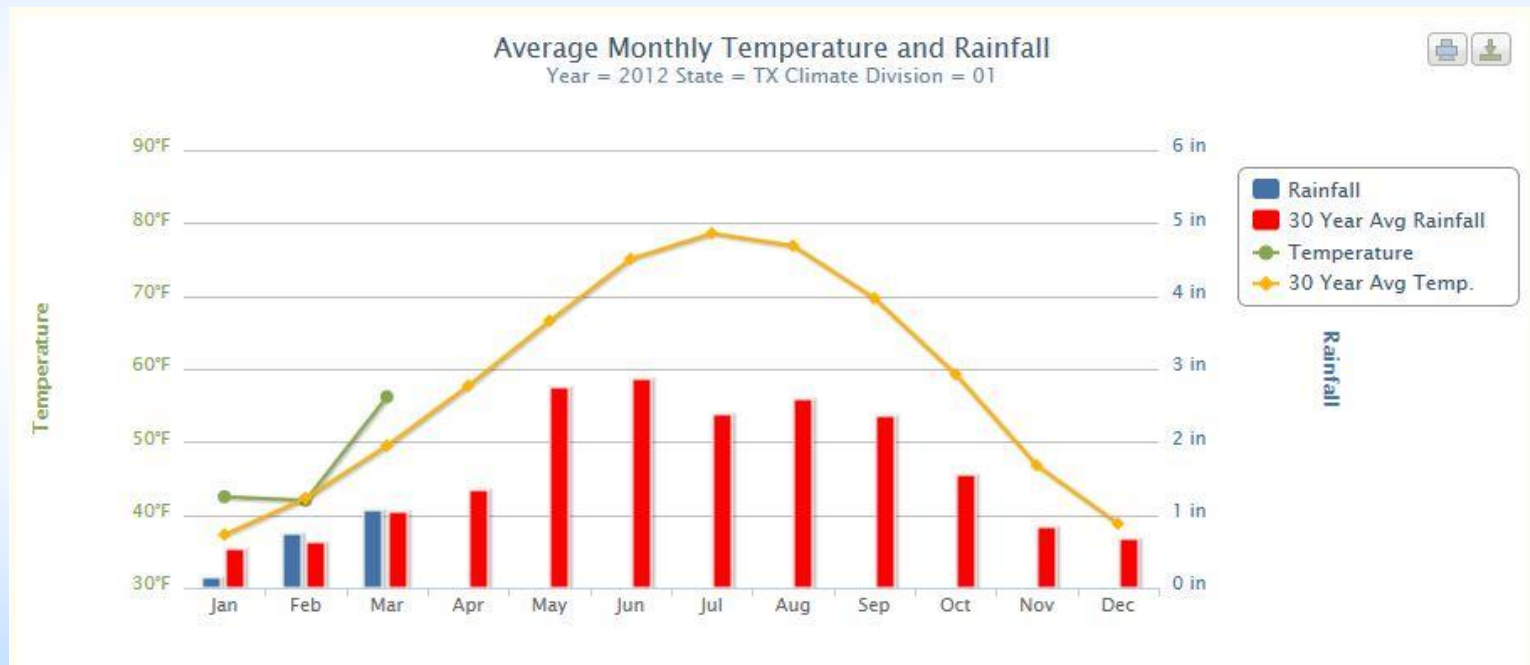
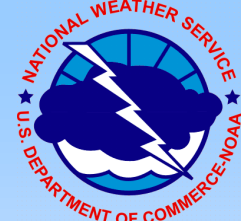


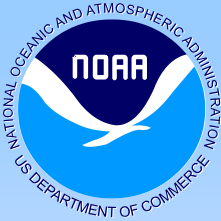
Record Heat in TX High Plains in Summer 2011



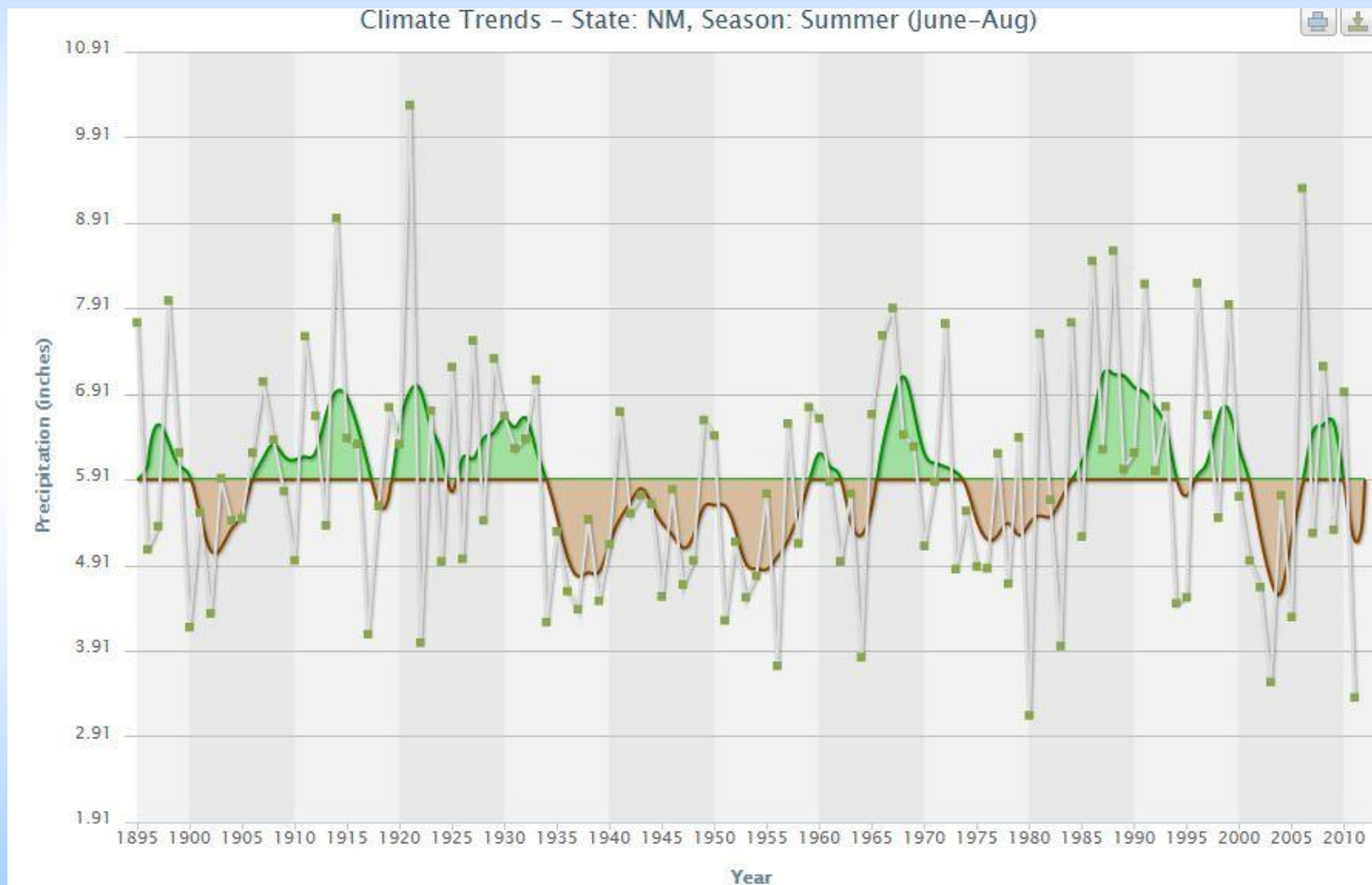
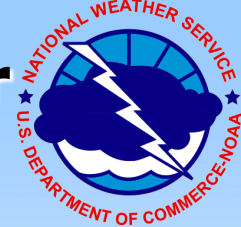


Slightly below normal precipitation in TX High Plains in early 2012 a continued cause for concern moving into the May/June wet season.

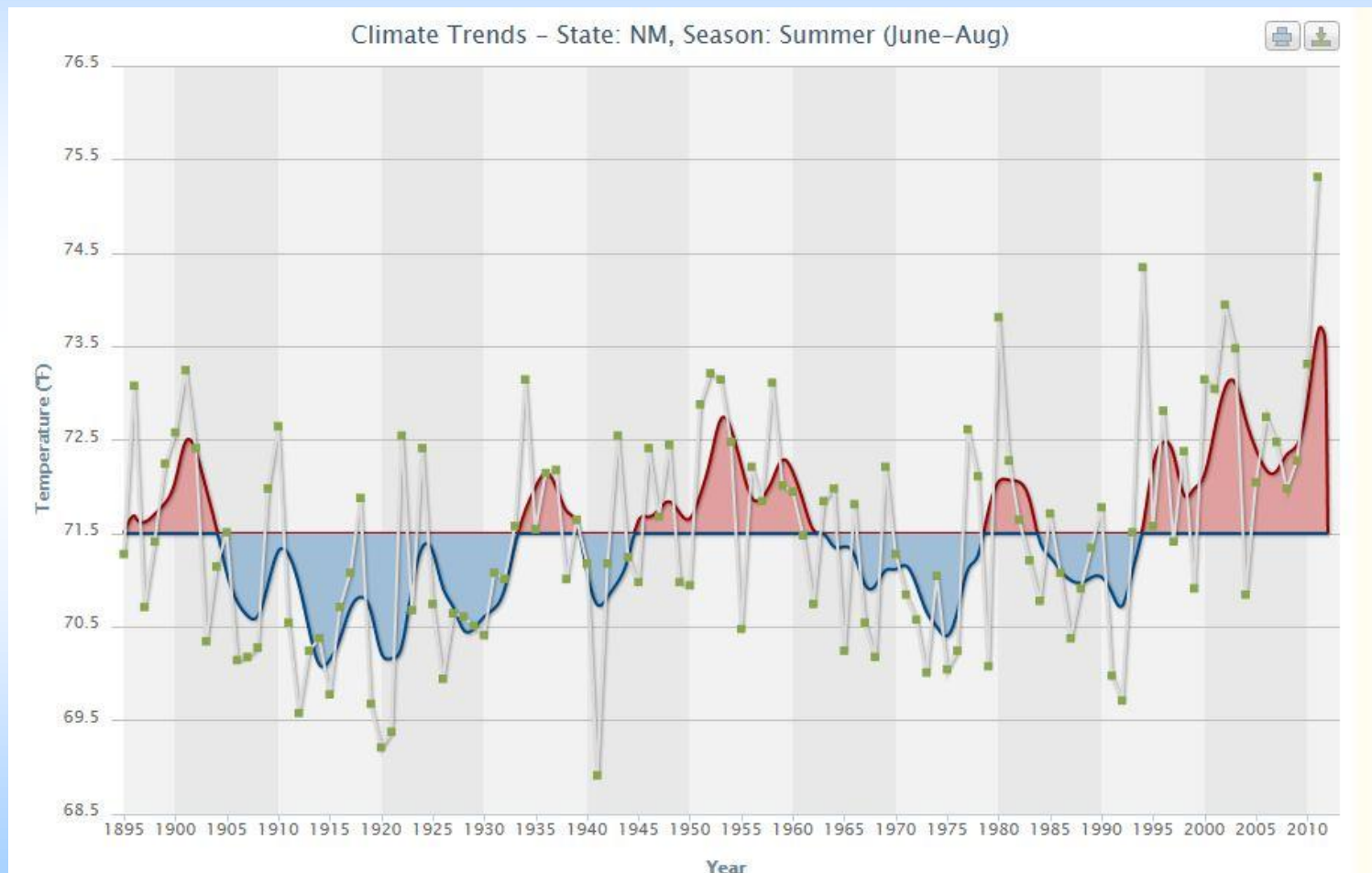


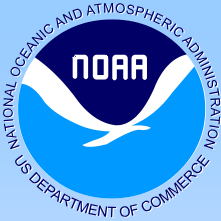


Summer Monsoonal Rainfall Trends for New Mexico. 2nd Driest Summer on Record in 2011 begets...

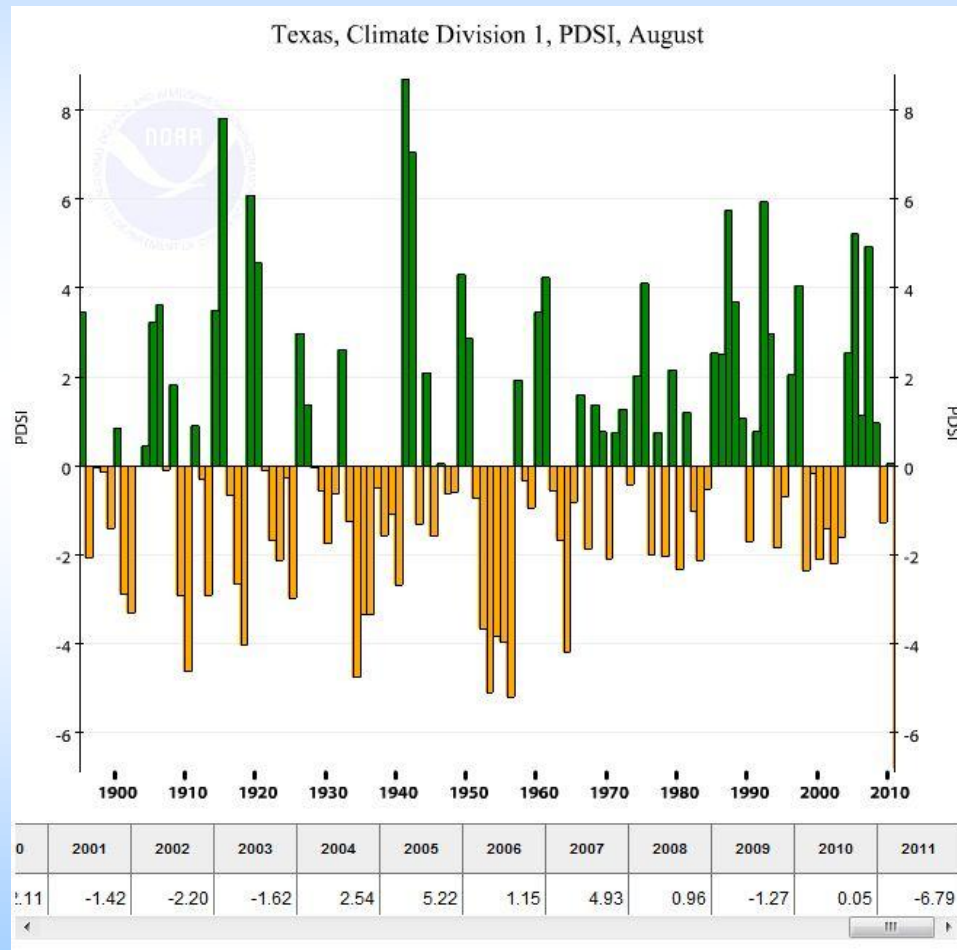
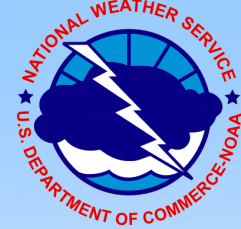


...warmest summer on record.



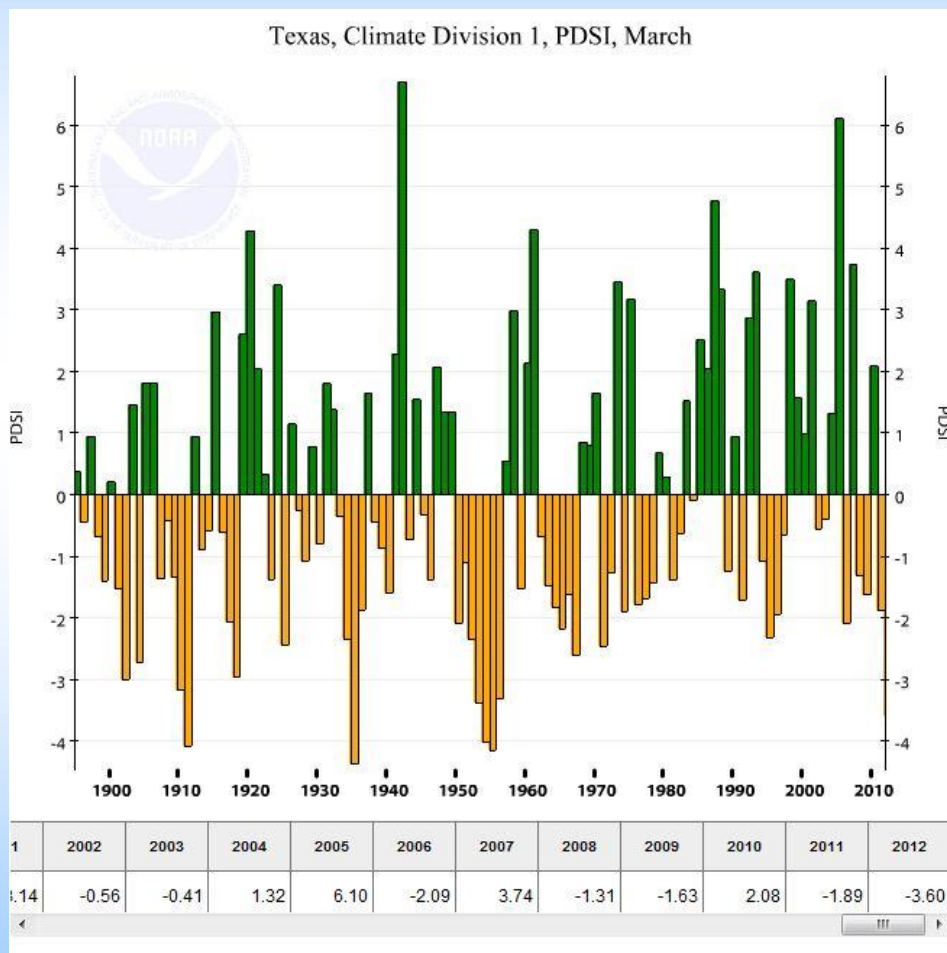


August 2011 saw most intense 1 year drought conditions ever on record for the TX High Plains.

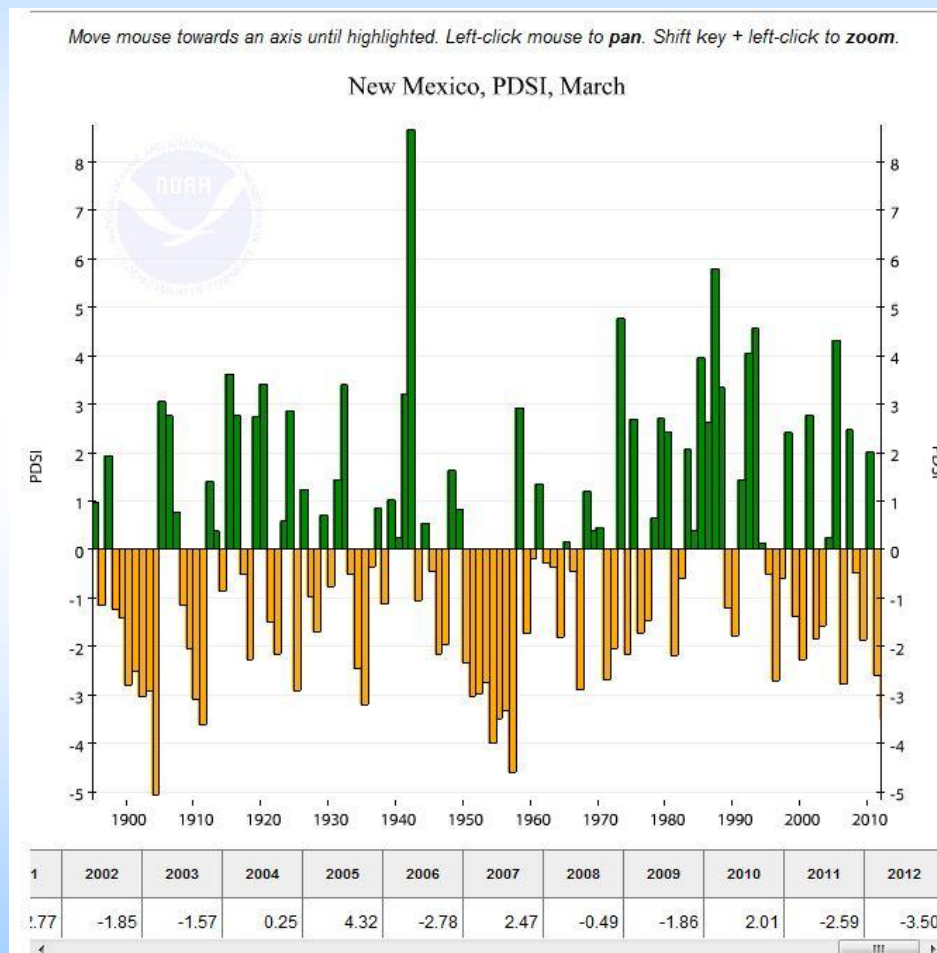


PDSI of -6.79 in August 2011.

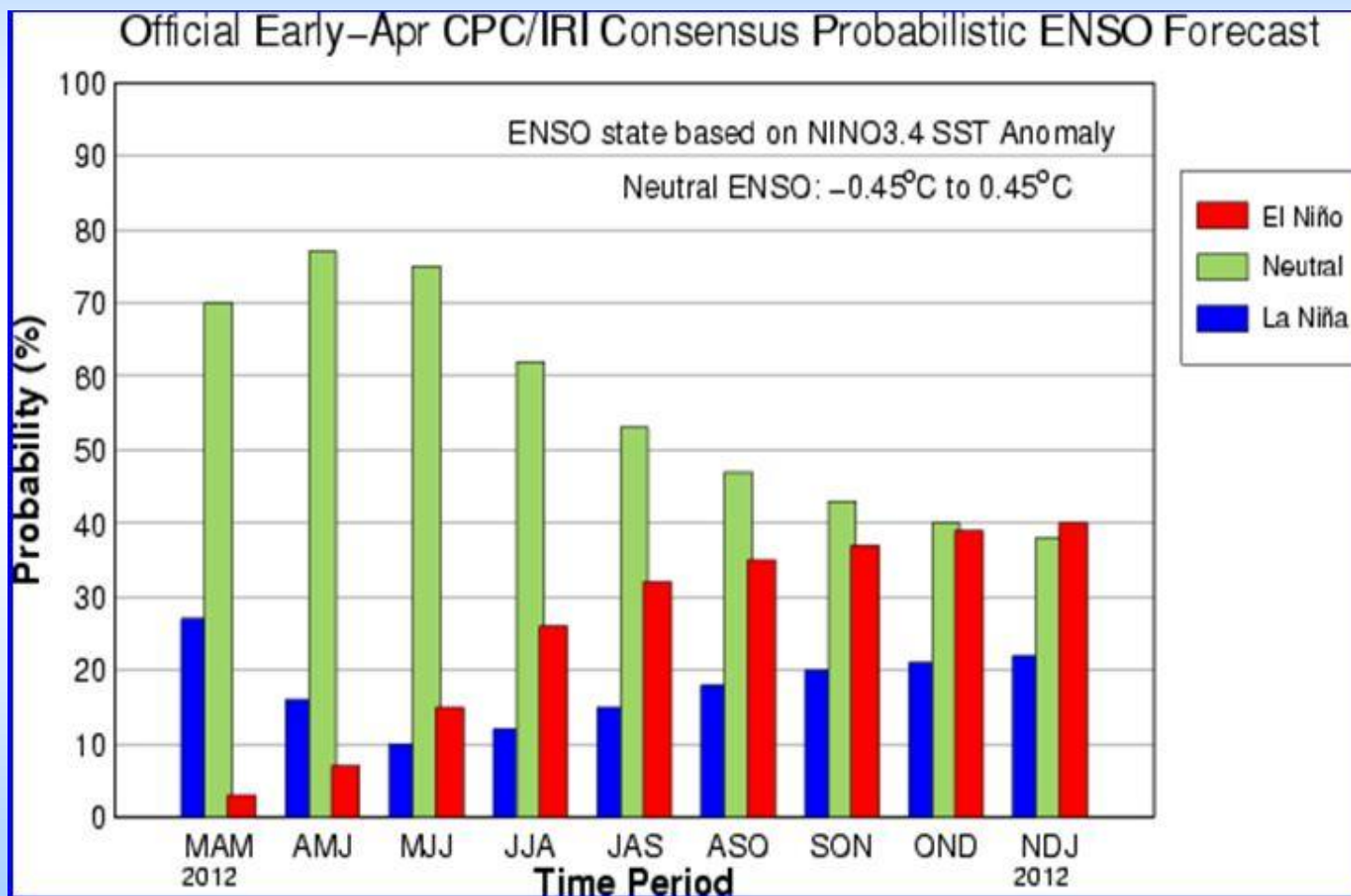
...but recent precipitation has improved conditions (relatively speaking).

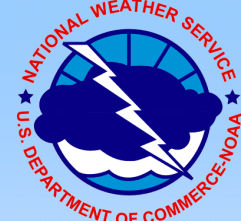
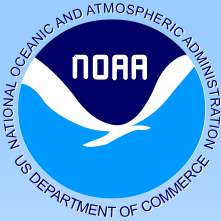


...likewise in New Mexico

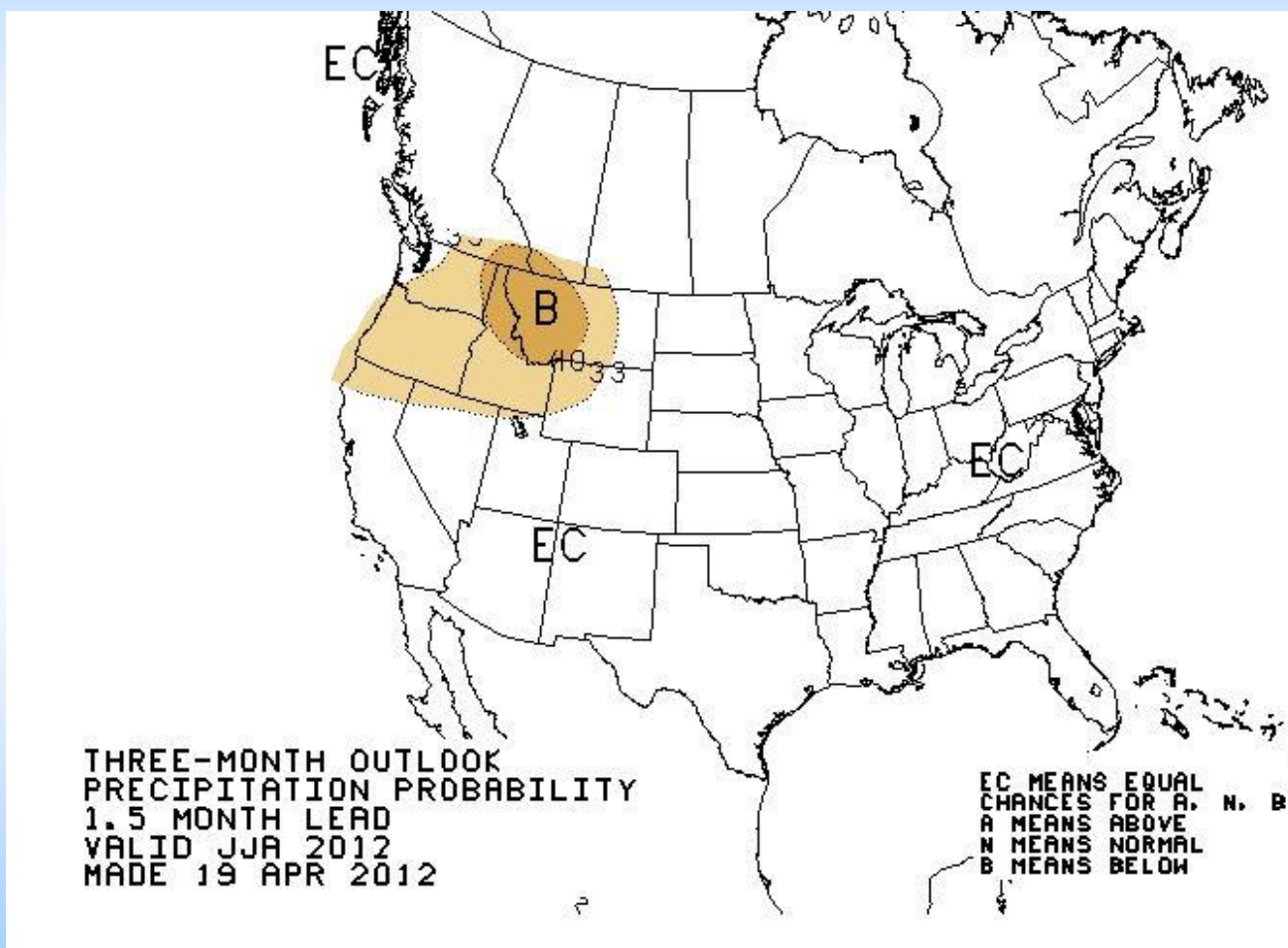


Good News!!! Probability of El Nino this winter outweigh those of La Nina by 2 to 1.

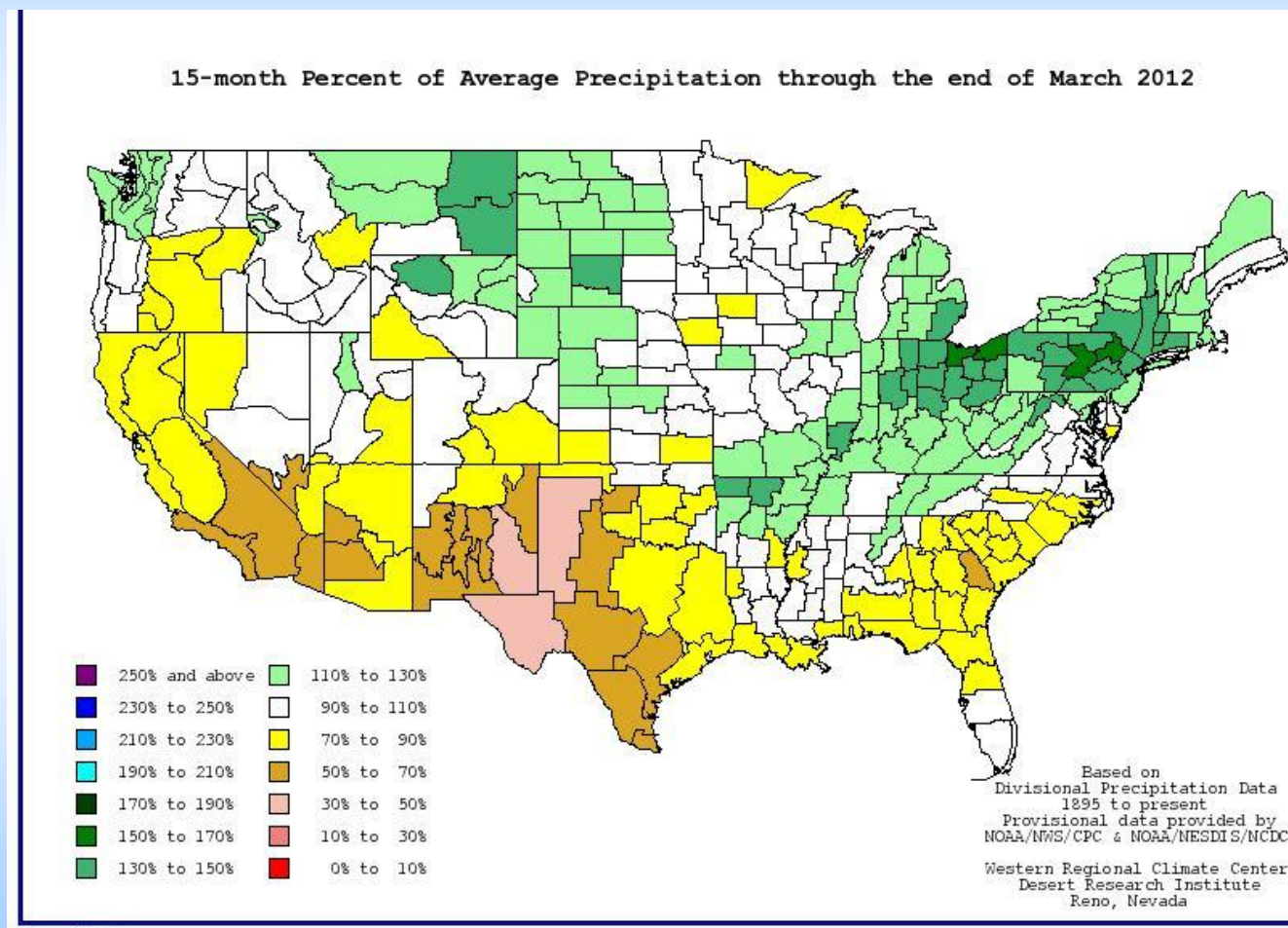




Latest NWS Climate Prediction Center Forecast for this Summer.

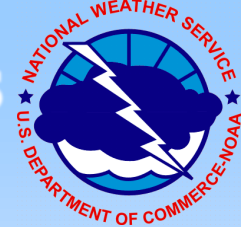


15 Month Percent of Average Precipitation through March 2012. Problem areas remain problem areas.

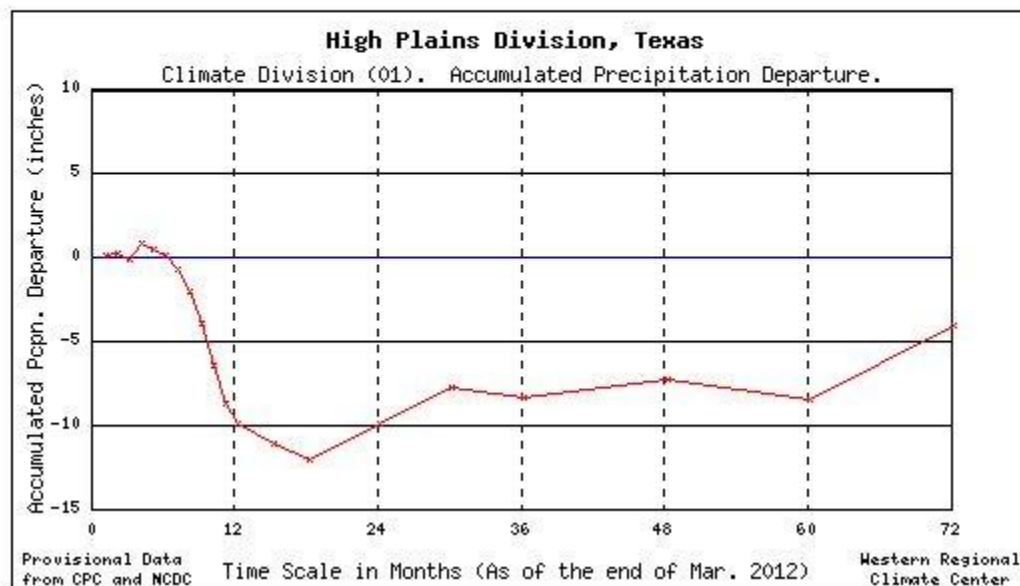


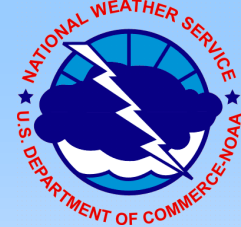
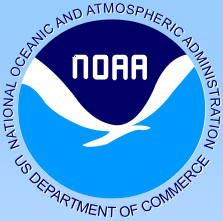


Precipitation Deficit for TX High Plains Climate Division. Average annual precipitation about 18"/year.



Accumulated Precipitation Departure from Normal





- Questions??

Victor Murphy

NWS Southern Region HQ

Climate Services Program Manager

Victor.Murphy@noaa.gov

817-978-2652 x 130